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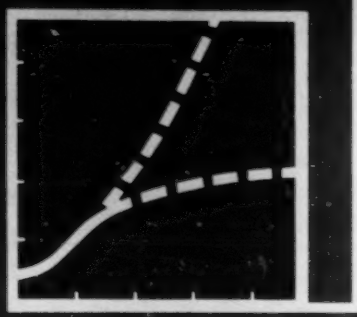

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Fertility and Family Planning Surveys: An Update

Editors' Summary. Over the last decade 61 countries in Africa, Asia, the Middle East, Latin America, and the Caribbean have gathered fertility and family planning information through the World Fertility Survey and Contraceptive Prevalence Surveys. Nearly half a million women have been interviewed, their answers recorded and tabulated, and the results analyzed. Together, these surveys constitute the largest body of knowledge on fertility and family planning in the world.

These surveys reveal striking differences in family planning practices. In the Latin American and Caribbean countries surveyed, about 40 percent of couples used family planning, on average; in most Asian countries, about 30 percent; in the Middle East and North Africa, about 20 percent. In most African countries south of the Sahara, where fertility remains very high, less than 10 percent of couples used any form of family planning. Also in Africa, unlike other areas, use of traditional family planning methods—abstinence after childbirth and prolonged breastfeeding—usually exceeds use of modern contraceptive methods. In most countries oral contraceptives (OCs) are the best known and most widely used method, but voluntary female sterilization is common in Latin America and parts of Asia and is spreading rapidly. Also, in many countries of Asia, Latin America, and the Middle East, women are marrying later. As a result of more family planning and later marriage, fertility is declining in many countries.

The World Fertility Survey (WFS) covered 41 countries in Asia, Africa, the Middle East, and Latin America and the Caribbean and asked a broad range of questions on fertility and family planning. Contraceptive Prevalence Surveys (CPS) covered 43 countries, some more than once, but focused on programmatic issues such as sources of family planning services and supplies. More than one comparable survey were conducted in 24 countries. Together, WFS and CPS covered over one-third of the world's population, even though the two most populous countries, China and India, were not included. This issue of **Population Reports** presents together for the first time, and in comparable form, major findings of all WFS and CPS surveys currently available from developing countries—89 in all, from 49 countries—as well as the results of major analyses of these data.

Knowledge of Family Planning

In most countries knowledge of some form of family planning is widespread. In 15 of 19 Latin American and Caribbean countries and 7 of 9 Asian countries, at least 90 percent knew of at least one method. In Fiji, South Korea, Sri Lanka, and Thailand, all women knew of at least one method. By contrast, in the 11 African countries with relevant data, an average of two-thirds of women knew of at least one method. Worldwide, OCs were best known, followed by voluntary female sterilization and the intrauterine device (IUD). Almost everywhere more women could name a modern method than a traditional one. Knowing a method does not mean having accurate information, however.

Use of Family Planning

The highest levels of contraceptive use in the developing world are found in Asia and in Latin America and the Caribbean. Over half of married women of reproductive age used some family planning method in South Korea, Sri Lanka, Thailand, Colombia, Costa Rica, Jamaica, Panama, Trinidad and Tobago, and parts of Indonesia and Brazil. In contrast, less than 5 percent used family planning in Cameroon, Ivory Coast, Mauritania, Senegal, Somalia, and Yemen Arab Republic; in Africa, use was highest in Zimbabwe, where 40 percent practiced family planning.

In most countries modern methods of contraception are most popular. In over 80 percent of countries surveyed, at least half of contraceptive users relied on OCs, IUDs, or voluntary female sterilization.

Worldwide, family planning is more often used to prevent births when family size is complete than to space births. In Asia only about one-quarter of contraceptive users said that they were spacing births; in Latin America and the Middle East, about one-third. By contrast, in Africa about three-quarters of the few women using contraception were spacing births but wanted more children later.

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Phyllis T. Piotrow, Ph.D., Director, Population Information Program; Walter W. Stender, Associate Director; Ward Rinehart, Editor and Associate Director.

Availability of Family Planning

Survey results indicate that making family planning supplies and services more available increases their use. Women who can obtain services close by are more likely to use family planning. Some women, although not a majority, do not know any sources of family planning. In some countries, including Bangladesh, Indonesia, Nepal, Barbados, the Dominican Republic, and Honduras, at least 25 percent of women said that they did not know a source of supplies and services.

Fertility Levels and Trends

Fertility rates are falling in much of the world. WFS provided the first widespread evidence of this, and CPS surveys have confirmed it. Women in Latin America and the Caribbean, particularly, are having fewer children. In some countries of Africa, however, where family planning has not yet spread, and where breast-feeding, postpartum abstinence, and disease-caused infertility are decreasing, fertility remains high.

Even in most developing countries where fertility had fallen, women surveyed were still having large families. The total fertility rate (TFR)—roughly the number of children an average woman would have if current fertility patterns were to continue—ranged from 2.4 to 6.5 in Latin America and the Caribbean, from 2.6 to 6.3 in Asia; from 5.3 to 8.5 in the Middle East and North Africa, and from 5.3 to 8.3 in sub-Saharan Africa. In general, women who married at age 22 or later averaged at least 0.5 children fewer than those who married at 18 or 19.

Infant and Child Mortality

Survey results underscore the importance of family planning to infant and child health. In particular, WFS data provide the best evidence yet of the importance of birth spacing. The higher that infant mortality rates are, the more important a long birth interval is to child survival. In Bangladesh the death rate for infants born within two years of the previous birth was twice as high as the rate for infants born two to three years after the previous birth. Estimated infant mortality rates varied greatly among the surveyed countries, ranging from 33 in Panama to 135 in Bangladesh to 162 in Yemen Arab Republic. In most countries rates appear to be falling.

Survey data show that in many countries breast-feeding contributes substantially to birth spacing and thus to child survival—although the length of its contraceptive effect is difficult to predict. The finding suggests the importance of providing family planning to breast-feeding women in time to avoid another pregnancy sooner than desired.

Program Applications

Fertility and family planning surveys have led to policy and program changes. After surveys disclosed high pregnancy rates among young women, the government of Trinidad and Tobago extended efforts to serve these women. Similarly, El Salvador, Honduras, and Panama increased efforts to reach rural areas when surveys showed much lower levels of contraceptive use in rural areas than in cities. Surveys have assessed the coverage of family planning messages in various communication media, measured the use of specific brands sold by social marketing programs, gathered women's opinions about service delivery programs, and influenced decisions to expand the availability of certain family planning methods.

An important use of survey data is estimating what progress family planning programs and other providers of family planning have made in serving the public and how much remains to be done—in other words, estimating the unmet need for family planning. One measure of unmet need is the percentage of married women who do not want another child immediately but are not using contraception. In 21 of 27 countries with available data, 75 percent or more said that they did not want another child now or within a year. The proportion of these women who are not using family planning varies greatly, however. In most Asian countries surveyed it was between one-third and one-half; in Latin America and the Caribbean, between about one-third and two-thirds; and in Africa, over 90 percent in most countries. In nearly all countries women who wanted to prevent any future births were more likely to be using contraception than those who wanted to postpone births. This suggests that family planning programs need to make more effort to provide temporary methods for women who want to space births.

In sum, the fertility and family planning surveys conducted through WFS and CPS have advanced not only knowledge, but also action. If the knowledge gained from these surveys guides future policies, family planning and health programs—and the people they serve—will benefit.

End of Editors' Summary.

BACKGROUND

The World Fertility Survey (WFS) and Contraceptive Prevalence Surveys (CPS) have produced a wealth of information on fertility and family planning in more than 60 developing and 20 developed countries. Both WFS and CPS are international research projects that have assisted countries in fielding their own nationally representative sample surveys. The World Fertility Survey has collected data on a wide range of topics related to fertility. Contraceptive Prevalence Surveys have focused more closely on data useful for the management and evaluation of family planning programs.

The World Fertility Survey conducted surveys in 41 developing countries between 1972 and 1984 (see Table 1, p. M-333). In addition, Hong Kong and Guadeloupe and Martinique (see Table 1) and 21 developed countries (see Table 2, p. M-332) conducted fertility surveys in collaboration with WFS but without its financial support.

The Contraceptive Prevalence Survey program ran from the mid-1970s to 1985. Some 43 Contraceptive Prevalence Surveys were conducted through this program in 33 countries. Apart from the CPS program, 24 similar Contraceptive Prevalence Surveys and Family Planning/Maternal-Child Health Surveys were conducted in 14 countries (see Table 1).

Some 19 developing countries currently have data available from more than one comparable survey; 17 conducted a WFS and one or more CPSs, and 2 conducted more than one CPS but no WFS. In these 19 countries the multiple surveys provide data on trends. In addition, five other countries are now completing the second of two comparable surveys. (In three more countries two surveys were completed but are not entirely comparable, one being national and the other regional.) The availability of such extensive, detailed, and comparable data covering so many countries, many at two or more times, is unprecedented.

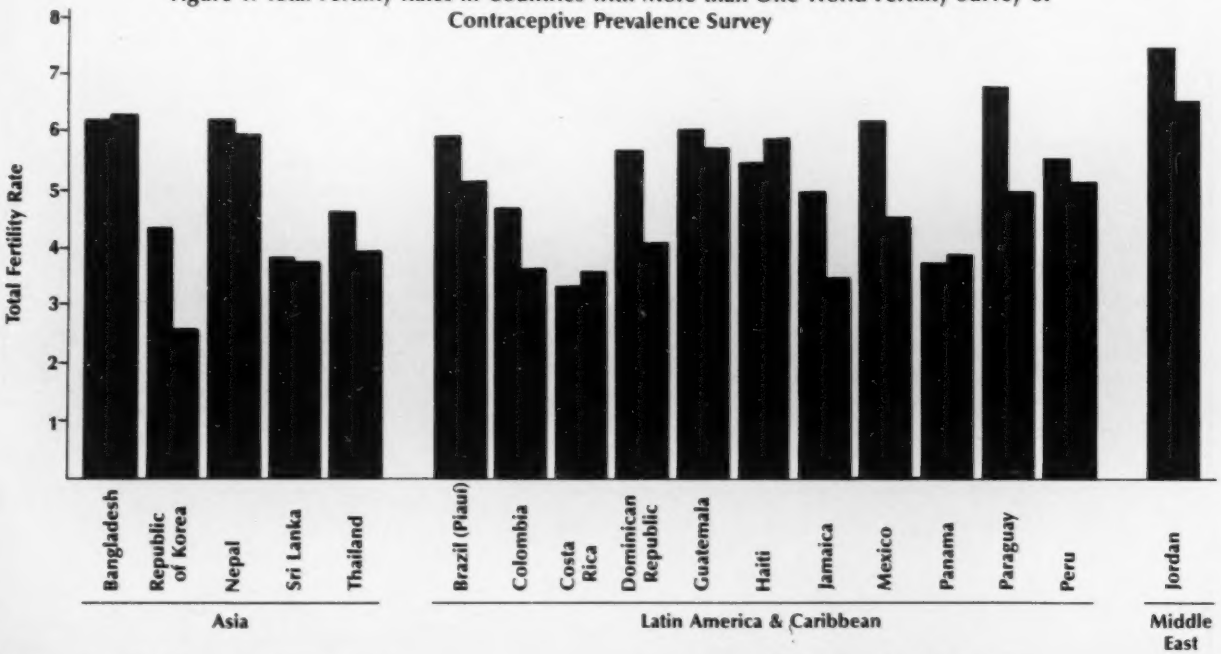
History of the WFS and CPS Projects

The World Fertility Survey and later the Contraceptive Prevalence Surveys were established to answer the need for high-quality data on fertility and family planning. Previously, most information came from censuses, vital statistics, family planning program statistics, and small surveys. Detailed cross-national comparisons were difficult because information was sketchy, often unreliable, and not comparable among countries or data sources. Censuses are expensive and infrequent. Even high-quality censuses and vital statistics lack detailed information on fertility, as do family planning program statistics. Also, program statistics cover only program clients and provide no information about other people or the population as a whole (546, 582, 612).

Before WFS, between 1960 and 1973, only 13 developed countries and 5 developing countries carried out national surveys asking a broad range of questions on fertility. Eleven more countries carried out fertility surveys covering a part of the country, such as a province or a large city (295, 296, 297, 298). Most survey data on fertility came from narrowly focused studies on knowledge of, attitudes toward, and practice of contraception—KAP surveys—which, among other shortcomings, collected no information on the availability of family planning services. Some of these were national surveys, but the majority covered smaller areas (547, 612).

In the early 1970s interest in population issues was growing, and family planning programs around the world had

Figure 1. Total Fertility Rates in Countries with More than One World Fertility Survey or Contraceptive Prevalence Survey



*Based on ever-married women rather than all women

**Based on women in union rather than all women

In some countries both the World Fertility Survey and a Contraceptive Prevalence Survey were conducted, allowing an examination of trends. Even in the few years between surveys, fertility declines are evident in the Republic of Korea (South Korea), Thailand, Colombia, the Dominican Republic, Jamaica, Mexico, Paraguay, and Jordan. Other survey evidence shows that in Sri Lanka and Costa Rica fertility declines preceded the first surveys. Fertility declines also have taken place in many countries with only one survey. **(See p. M-318.)**

already started to expand. More, better, and internationally comparable data were needed to answer questions and guide programs. Responding to that need, in June 1971, R.T. Ravenholt, then Director, Office of Population, United States Agency for International Development (US AID), started action that led to development of WFS. In the following months the Office of Population planned and budgeted for this unique global enterprise and enlisted the support and participation of the United Nations Fund for Population Activities (UNFPA), the UN Population Division, the UN Statistical Office, the International Statistical Institute (ISI), and the International Union for the Scientific Study of Population (IUSSP) (583, 630). Within US AID, James Brackett and later Richard Cornelius provided technical guidance for WFS work, and Cornelius developed the subsequent CPS and Demographic and Health Survey projects.

Officially established in 1972 under the management of ISI, WFS was funded mainly by US AID and UNFPA, with additional support from the United Kingdom, France, Canada, and Japan. Sir Maurice Kendall was the first director of WFS. He was followed by Milos Macura, V.C. Chidambaram (acting), Dirk J. van de Kaa, and Halvor Gille (140, 357).

How to Obtain WFS/CPS Data for Analysis

World Fertility Survey

Data files. With the closing of the WFS London headquarters in December 1984, responsibility for WFS data tapes was transferred to the Dynamic Data Base, operated by the International Statistical Institute Research Centre (ISIRC) of the International Statistical Institute (ISI) in Voorburg, near The Hague, Netherlands. Data collected in the WFS program remain the property of the individual participating countries. Each country has specified conditions under which its data may be released for research purposes. For any new project, researchers must complete an application form and sign an agreement establishing conditions for use of the data. Both are available on request from ISIRC.

All data sets are sent airmail on magnetic tapes. Each is accompanied by a machine-readable data dictionary and frequency distributions. For each country, data are available in the same format as the country questionnaire or in a recoded format standardized across countries—the standard recode files. SPSS parameters are available for most standard recode files. A handling fee of $60 (US), payable in advance, is charged for each data file requested. A summary of the variables available has been published for 41 WFS surveys (284).

ISIRC staff are available to advise researchers on problems of research design, statistical analysis, and computer processing. The ISIRC also will undertake special analyses of WFS data on behalf of organizations.

Researchers interested in using the WFS data files or in obtaining more information about them should write to:

Head, Dynamic Data Base
International Statistical Institute Research Centre
428 Prinses Beatrixlaan
P.O. Box 950
2270 AZ Voorburg
Netherlands

Publications. A list of WFS publications and order forms are available on request from the International Statistical Institute. A list of WFS publications, along with a comprehensive list of other publications based on WFS data, also appears in the WFS final report (357). Most WFS publications are free. There is a handling fee of $10 (US) for main country reports, however ($2 for each additional report in the same order). The 3-volume proceedings of the WFS 1980 Conference are available at a cost of $25. To obtain WFS publications, write to the Publications Office, ISI, at the above address. WFS publications are listed as numbers 1–364 in the bibliography on pp. M-340–344.

Contraceptive Prevalence Surveys

Data files. Data tapes containing Contraceptive Prevalence Survey or Family Planning/Maternal-Child Health Survey information are usually available to qualified researchers on request once the final country report has been released by the country. These tapes may be obtained with the permission of the in-country agency responsible for the CPS in each country and under the conditions set by that agency. A summary of the variables available has been published for 17 CPS surveys (576).

Requests may be made through the US organization assisting with the survey, in most cases either Westinghouse Public Applied Systems (WPAS) or the Division of Reproductive Health of the US Centers for Disease Control (US CDC), as indicated in Table 1. WPAS charges a fee of $60 (US) for the first country on the tape and $15 for each additional country file on that tape. Requests also may be made to the in-country agency involved in the survey (see Table 1).

Publications. Published and unpublished reports, working papers, and other documents relating to the Contraceptive Prevalence or Family Planning/Maternal-Child Health Surveys are available from WPAS and US CDC. WPAS charges a small fee (US$.06 per page) for reproduction of reports that are out of print.

For more information about CPS data files and to order publications, write to:

Demographic and Health Surveys/CPS
Westinghouse Public Applied Systems
P.O. Box 866
American City Building, No. 400
Columbia, Maryland 21044, USA

or

Chief, Program Evaluation Branch
Division of Reproductive Health
Center for Health Promotion and Education
Centers for Disease Control
Atlanta, Georgia 30333, USA

CPS publications are listed as numbers 365–472 in the bibliography on pp. M-344–345.

The main goals of WFS were:

1. To assist countries to collect accurate, detailed demographic and fertility data;
2. To increase the capability of agencies in developing countries to carry out demographic and fertility research; and
3. To provide researchers throughout the world with internationally comparable data on fertility levels and differentials, family size ideals, and knowledge and practice of family planning (358, 364, 565, 630).

By the mid-1970s a need for more rapid, less costly, and more program-related data to guide family planning administrators became apparent to US AID officials. Following successful prototype surveys undertaken by the US Centers for Disease Control (US CDC) in El Salvador in 1975 and Paraguay in early 1977, US AID expanded survey activities. In 1977 the CPS project, designed to provide technical assistance and support for survey operations, was competitively awarded to Westinghouse Public Applied Systems (WPAS) (then Westinghouse Health Systems). The project was directed by Lawrence Smith. Other US AID supported studies, called Family Planning/Maternal-Child Health (FP/MCH) Surveys, also collected data on use of contraception, sources of contraception, and information to plan and evaluate family planning and maternal-child health programs (598). Technical assistance for this type of survey was provided by the Division of Reproductive Health (formerly the Family Planning Evaluation Division) of US CDC. US CDC has also provided technical assistance for Contraceptive Prevalence Surveys. The CDC survey activities have been conducted under the supervision of Leo Morris. In addition, in several Brazilian states, FP/MCH surveys were conducted through Family Health International (FHI) (formerly the International Fertility Research Program) and the Center for Population and Family Health (CPFH), Columbia University. Because FP/MCH surveys collected important data on family planning and contraception, for the remainder of this report the term CPS will refer both to Contraceptive Prevalence Surveys and to Family Planning/Maternal-Child Health Surveys.

The specific objectives of CPS were:

1. To measure rates of contraceptive use;
2. To identify differentials in contraceptive use in order to assess program impact and indicate who might benefit from special program efforts;
3. In each participating country, to increase the capacity to carry out such research regularly; and,
4. To make survey findings widely available (578).

Although the WFS project officially ended in December 1984, and the CPS project, in December 1985, archives for both projects are being maintained, and data tapes are available to researchers. The International Statistical Institute Research Centre (ISIRC), part of ISI, maintains the archive for the WFS project. The archive contains data for all participating developing countries except Iran. WPAS maintains CPS data tapes for WPAS surveys. US CDC does not maintain data tapes but can obtain them on request. (See box, p. M-292.)

In September 1984, with support from US AID, WPAS initiated the Demographic and Health Surveys (DHS) project, the successor to the WFS and CPS projects. DHS is collecting population and health data in 31 developing countries (see box, p. M-304). Robert J. Lapham is project director.

Comparability of WFS and CPS Data

Both the WFS and the CPS questionnaires included a core of basic questions. These questions were asked in every survey so that comparable data would be available for all countries. In addition, both programs offered optional questions to tailor the survey to the needs and social setting of each participating country.

The WFS core questionnaire contained two sections: the household schedule and the individual questionnaire. The household schedule asked the age, sex, and marital status of all members of the household. Some countries also collected fertility histories for all women in the household. The main part of the survey, the individual questionnaire, collected data on (1) the background of the respondent—for instance, age, level of education, and literacy; (2) complete maternity history; (3) knowledge and use of contraception; (4) marital history; (5) exposure to the risk of conception; (6) work history; and (7) husband's background. Optional modules—supplementary sets of questions on special topics—were used in many countries. These modules explored in detail such topics as fertility regulation (including the availability of contraceptives), factors other than contraception affecting fertility, family planning, the economic well-being of the household, measures of community development, and mortality (154).

The CPS and FP/MCH questionnaires served programmatic needs by including more detailed questions on perceptions and use of family planning services. After asking about the woman's background and sometimes taking an abbreviated maternity history, the questionnaire asked about (1) fertility intentions, (2) knowledge and use of contraception, (3) knowledge of places where family planning supplies and services are offered, and (4) attitudes about the convenience of the source of supplies and services (466). Information generally was not collected about members of the household other than the woman being interviewed.

The CPS questionnaire was much shorter than the WFS questionnaire, typically 20 pages rather than 40 pages. The brevity and narrower focus of the CPS questionnaire saved time and money at each stage of the survey (572). Thus the CPS program could make data available to family planning program evaluators and policy-makers more quickly than WFS. Also, surveys could be repeated more economically to assess trends (477, 576, 578, 602). The data available for analysis are not as wide-ranging as WFS data, however.

WFS surveys took about four years on average. Not counting host country contributions, the total cost of 41 WFS surveys was about $49 million (US), or an average of about $1.2 million per survey. Excluding technical assistance costs, headquarters costs, and costs of further analysis, however, and including host country contributions, the average survey cost about $350,000 (572, 630). CPS surveys took just over two years to complete. The total cost for 43 surveys conducted under the Contraceptive Prevalence Survey program was about $13.1 million, or an average of $305,000 per survey. Excluding technical assistance, headquarters costs, and further analysis costs and including host country contributions, the average survey cost about $165,000. Actual costs of each WFS and CPS survey varied considerably.

Although WFS and CPS questionnaires differed, data common to both surveys have been made as comparable as possible for this report through a series of special tabulations. Thus most of the tables presented here are restricted to currently married women age 15–44, even though some surveys interviewed ever-married women or all women regardless of marital status, and many surveys interviewed women age 15–49 (see Table 1).

John Anderson of US CDC and John Cleland of ISIRC reviewed differences between WFS and CPS and how they might affect substantive analyses (478). On one hand, because WFS data are more extensive—including, for example, the date of each birth—they allow more reliable estimates of fertility rates, infant and child mortality rates, and breast-feeding patterns than CPS data. Also, in questions referring to specific methods of contraception, WFS interviewers described the methods in detail, while CPS interviewers generally gave only the names of methods. This difference apparently led CPS respondents to underreport knowledge of traditional methods such as rhythm and withdrawal. Use of traditional methods also may be underreported, although the evidence is less clear (478, 671).

On the other hand, CPS data can address some topics that WFS data cannot: (1) WFS asked only currently married women if they were using contraception. Some CPSs asked all women in the sample and thus, where unmarried women were interviewed, can study contraceptive use among these women as well. (2) Fewer than half of the WFS surveys asked women when they wanted their next birth. Most CPS surveys asked that question and so can distinguish women who want to space births from women who want to end childbearing. (3) CPS collected more systematic information on knowledge of, proximity to, and use of sources of supply than WFS. This information, together with information on preferred method of contraception, offers greater scope for analysis of supply-related determinants of contraceptive use (478). Both WFS and CPS are limited in providing data on contraceptive continuation and on migration.

KNOWLEDGE OF FAMILY PLANNING

In most countries fertility and family planning surveys have found that the great majority of women know of at least one family planning method, usually a modern one (292, 458, 459, 579). Women's knowledge of family planning is slightly influenced by age, very little influenced by parity, somewhat influenced by rural/urban residence, and greatly influenced by education. Generally, the differences between rural and urban women and between educated and less educated women are greatest where overall levels of knowledge are lowest. This reflects the fact that educated, urban women are usually the first to learn about family planning. Having heard of a method, of course, does not mean having useful or accurate information about where to obtain it or how to use it.

WFS and CPS surveys revealed that knowledge was most widespread in Latin America and the Caribbean. In 15 of the 19 countries surveyed in this region, 90 percent of the women knew at least one family planning method (see Table 3). In Asia the percentage knowing a method ranged from 52 in Nepal to 100 in Fiji, South Korea, Sri Lanka (1982), and Thailand (1978, 1981). In Africa knowledge was less widespread. In the 11 African countries with relevant data, the percentage of women who knew at least one method ranged from 32 percent in Nigeria to 94 percent in Kenya and averaged over 60 percent. (This regional average, and others presented in this report, give each surveyed country equal weight, regardless of population size. Figures based on WFS and CPS data are not necessarily representative of an entire region or of developing countries generally. For the most part, the countries interested in and able to conduct surveys are among the countries with greater interest and program effort in family planning. Thus measures of knowledge and use may be higher than in countries not surveyed.)

Women are much more likely to know about modern methods than about traditional methods. Most women who have heard of contraception know at least one modern method—OCs, voluntary sterilization, IUDs, condoms, injectable contraceptives, or vaginal methods such as diaphragms and spermicides (see Table 3). Only in four African countries—Benin, Ivory Coast, Senegal, and Zaire—did a substantial percentage of women know only about traditional methods—douche, withdrawal, rhythm, abstinence, and other, folk methods. In an analysis of 19 WFS countries, Martin Vaessen found that women were much more likely to name modern methods spontaneously than to name traditional methods. They usually acknowledged traditional methods only after they were asked specifically about them (292).

Worldwide, OCs were the most widely known method (see Table 3). Female sterilization and the IUD were next. In Africa injectables were also relatively well-known. In Asia and the Pacific male sterilization and condoms were often as well-known as IUDs, although not as well-known as OCs. Of the three male methods, generally women were more familiar with condoms and less familiar with voluntary male sterilization and withdrawal. In nearly every country more women had heard of female sterilization than had heard of male sterilization.

Costa Rican women surveyed in 1981 demonstrated the broadest knowledge of contraceptive methods. Each method was familiar to more than 60 percent of the women. In most countries, however, some methods were widely known while others were not.

Influence of Age, Parity, Residence, and Education

Age. Women's age is not closely linked with knowledge of contraception in most countries. Knowledge of contraception differed by no more than five percentage points across age groups in Kenya, Bangladesh (1979–80), Fiji, Nepal, the Philippines, Sri Lanka, Thailand, Brazil, Colombia, Costa Rica, Dominican Republic, El Salvador, Jamaica, Panama, Trinidad and Tobago, Venezuela, and Jordan (see Table 3).

In many countries, however, the very youngest and the very oldest women were least knowledgeable. The lower level of knowledge among married women age 15–19 was most evident in Benin, Ivory Coast, Lesotho, Nigeria, Zimbabwe, Peru (1981), and parts of Somalia, Zaire, and Indonesia. In these areas the number of women age 15–19 knowing of any method fell short of the number of women age 20–24 knowing any method by 12 to 20 percentage points. The lack of knowledge among young women appears to be real, not merely a greater reluctance to discuss

Table 3. Knowledge of Contraceptive Methods Among Currently Married Women Age 15–44, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	% Knowing: Any Method	Traditional Only[a]	Any Modern[b]	Voluntary Sterilization: Female	Voluntary Sterilization: Male	OCs	IUDs	Condoms	Injectables	Vaginal Methods	Rhythm	Withdrawal
AFRICA												
Benin 1981–82	40	27	13	0	0	8	9	6	0	5	11	12
Botswana 1984	82	1	80	45	9	79	73	54	69	30	21	24
Cameroon 1978	34	6	28	†	†	20	18	13	†	4	20	14
Ghana 1979–80	69	9	61	31	4	49	36	30	23	26	21	19
Ivory Coast 1980–81	84	66	18	†	†	14	7	10	†	5	12	9
Kenya 1977–78	94	5	89	59	16	79	55	43	61	22	54	26
Lesotho 1977	66	5	61	35	10	47	22	28	32	10	12	42
Mauritania 1981	8[c]	2[c]	6[c]	1[c]	1[c]	6[c]	1[c]	0[c]	0[c]	1[c]	0[c]	1[c]
Nigeria 1981–82	32	12	20	7	2	12	4	5	10	2	9	6
Senegal 1978	60	39	21	†	†	18	9	8	4	2	10	†
Senegal (Sine-Saloum) (rural) 1982	80	21	59	45	0	43	18	17	32	6	9	7
Somalia (urban) 1983												
Baydhaba	48	0	48	18	6	36	17	18	39	6	10	7
Hargeisa	43	1	42	11	8	38	7	8	30	5	6	2
Kismayu	22	0	22	1	0	20	3	1	16	1	0	0
Mogadishu	42	0	42	10	7	35	18	21	28	12	6	4
Sudan (north) 1978–79	51	1	50	24	3	48	14	6	25	3	10	5
Zaire (urban) 1982–84												
Kananga	86	37	49	19	1	36	8	10	14	1	12	3
Kinshasa	86	27	59	12	3	46	27	13	40	7	20	15
Kisangani	76	49	27	8	0	21	5	3	7	1	8	2
Lubumbashi	94	37	57	11	1	50	12	7	21	4	29	6
Zimbabwe 1984	90	2	89	46	12	88	47	56	76	19	23	65
ASIA & PACIFIC												
Bangladesh 1975–76	83	3	80	54	53	65	41	32	†	11	22	16
Bangladesh 1979–80	96	0	96	85	72	94	34	60	43	8	13	3
Fiji 1974	100	0	100	96	41	99	97	85	49	41	58	56
Indonesia (Java & Bali) 1976	80	1	79	12	9	75	53	45	19	5	13	8
Indonesia (urban) 1983												
Jakarta	96	0	96	72	45	95	89	86	88	16	43	18
Medan	93	0	93	65	21	90	82	78	82	12	47	23

Region, Country & Year	% Knowing Any Method, by: Age 15–19	Age 20–24	Age 25–29	Age 30–34	Age 35–39	Age 40–44	No. of Living Children 0–1	No. of Living Children 2–3	No. of Living Children 4+	Residence: Rural	Residence: Urban	Education: None	Education: Less than Complete Primary	Education: Complete Primary or More
AFRICA														
Benin 1981–82	23	39	45	43	42	40	32	43	45	35	54	38	55	58
Botswana 1984	73	84	88	86	80	69	78	86	82	79	88	67	84	92
Cameroon 1978	33	43	37	31	29	29	34	34	35	30	55	20	45	67
Ghana 1979–80	61	72	74	69	65	69	68	68	72	64	80	57	79	88
Ivory Coast 1980–81	73	85	87	88	86	88	75	90	88	86	81	83	88	91
Kenya 1977–78	90	94	94	94	94	94	91	94	95	94	95	91	96	97
Lesotho 1977	46	64	73	72	72	64	56	72	73	65	74	53	59	68
Mauritania 1981	7[c]	9[c]	9[c]	9[c]	7[c]	5[c]	8[c]	8[c]	8[c]	5[c]	13[c]	4[c]	9[c]	16[c]
Nigeria 1981–82	25	37	32	32	32	31	24	34	36	29	44	24	38	62
Senegal 1978	46	64	66	63	62	62	55	63	64	56	70	58	71	84
Senegal (Sine-Saloum) (rural) 1982	71	81	80	83	84	78	74	81	83	80		80	*	*
Somalia (urban) 1983														
Baydhaba	26	54	55	47	51	33	45	46	53		48	43	55	80
Hargeisa	60	53	51	45	34	25	46	49	38		43	38	52	86
Kismayu	9	23	24	21	24	24	15	22	28		22	19	29	40
Mogadishu	42	42	44	46	42	24	40	40	43		42	37	49	67
Sudan (north) 1978–79	50	56	51	53	49	46	48	48	55	42	77	42	81	89
Zaire (urban) 1982–84														
Kananga	85	89	89	91	83	75	83	90	87		86	77	83	92
Kinshasa	74	85	88	91	91	87	80	87	92		86	80	86	87
Kisangani	66	81	81	81	74	54	68	82	79		76	62	73	84
Lubumbashi	91	95	98	96	94	83	92	97	95		94	93	94	95
Zimbabwe 1984	78	92	92	93	92	88	83	91	94	87	95	81	90	96
ASIA & PACIFIC														
Bangladesh 1975–76	78	85	87	85	82	83	77	85	87	82	92	80	92	95
Bangladesh 1979–80	96	96	96	95	95	94	95	96	96	95	97	95	97	100
Fiji 1974	99	100	100	100	100	100	100	100	100	100	100	100	100	100
Indonesia (Java & Bali) 1976	73	83	83	82	81	76	75	83	84	79	90	74	84	92
Indonesia (urban) 1983														
Jakarta	95	95	98	97	94	92	93	97	96		96	82	95	99
Medan	85	91	93	95	95	92	87	93	96		93	79	89	96

Table 3 (continued). Knowledge of Contraceptive Methods

Region, Country & Year	% Knowing: Any Method	Traditional Only[a]	Any Modern[b]	Voluntary Sterilization: Female	Voluntary Sterilization: Male	OCs	IUDs	Condoms	Injectables	Vaginal Methods	Rhythm	Withdrawal	% Knowing Any Method, by: Age 15–19	Age 20–24	Age 25–29	Age 30–34	Age 35–39	Age 40–44	No. of Living Children 0–1	No. of Living Children 2–3	No. of Living Children 4+	Residence: Rural	Residence: Urban	Education: None	Education: Less than Complete Primary	Education: Complete Primary or More
Indonesia (cont.)																										
Semarang	96	0	96	76	48	94	86	81	91	17	39	19	90	97	99	97	93	94	93	98	97		96	86	97	99
Surabaya	89	0	89	74	35	87	79	79	72	18	47	28	69	89	94	94	89	83	81	94	92		89	63	83	96
Ujung Pandang	81	0	81	46	15	76	67	53	68	13	32	15	66	79	87	84	79	78	70	85	84		81	46	78	92
Korea, Rep. of 1974	98	0	98	68	86	96	93	79	5	1	62	39	91	97	99	99	99	97	97	99	99	98	99	96	99	99
Korea, Rep. of 1979	100	0	100	96	95	98	96	86	43	57	63	46	94	99	100	100	100	99	99	100	100	99	100	99	100	100
Malaysia (peninsular) 1974	94	2	92	75	37	90	43	56	51	28	41	33	90	95	96	94	93	90	92	95	94	92	98	87	95	97
Nepal 1976	24	1	23	12	14	8	5	4	†	†	†	†	18	22	27	24	25	25	18	25	30	22	77	21	50	74
Nepal 1981	52	0	52	45	38	25	9	14	9	0[c]	0[c]	0[c]	50	52	54	54	50	50	48	52	58	51	75	50	79	90
Pakistan 1975	76[c]	0[c]	75[c]	9[c]	2[c]	85[c]	64[c]	20[c]	18[c]	9[c]	0[c]	1[c]	62[c]	74[c]	79[c]	80[c]	79[c]	78[c]	68[c]	77[c]	81[c]	73[c]	82[c]	73[c]	90[c]	90[c]
Philippines 1978	95	0	95	76	71	91	87	89	†	41	68	68	91	93	96	95	95	94	92	97	95	93	98	63	91	97
Sri Lanka 1975	93	1	92	85	41	82	65	54	45	12	46	22	82	91	93	95	95	95	88	95	94	92	95	84	90	96
Sri Lanka 1982	100	0	100	99	87	91	81	77	75	10	61	36	97	100	100	100	100	100	99	100	100	100	100	99	99	100
Thailand 1975	97	0	97	43	48	16	36	42	51	21	30	22	93	97	98	98	97	95	96	98	97	97	99	91	98	98
Thailand 1978	100	0	100	97	87	99	93	84	92	20	35	26	99	100	100	100	100	100	100	100	100	100	100	100	100	100
Thailand 1981	100	0	100	97	93	98	93	86	95	22	45	31	100	100	100	100	100	100	100	100	100	100	100	97	100	100
LATIN AMERICA & CARIBBEAN																										
Barbados 1980–81	99	0	99	82	63	97	77	84	80	73	44	52	98	99	100	100	99	93	99	98	100	——99——		100	95	99
Bolivia 1983	57	6	51	28	9	43	31	18	30	18	39	11	54	62	62	57	52	52	59	58	56	42	79	28	47	83
Brazil																										
Amazonas (urban) 1982	98	0	98	91	37	97	27	65	33	47	82	37	95	98	100	99	99	96	98	99	98		98	92	97	99
Northeast region 1980	99	0	99	94	30	97	39	68	14	41	74	45	95	100	99	99	99	99	98	99	99	98	100	98	99	100
Piauí 1979	97	0	97	93	16	94	17	48	28	21	59	33	94	97	99	98	92	98	96	98	97	97	96	96	97	98
Piauí 1982	100	0	100	98	28	99	19	68	27	38	65	29	99	100	100	100	99	100	99	100	100	100	100	99	100	100
São Paulo 1978	99	0	99	83	49	97	42	91	35	36	66	57	99	99	100	99	99	99	99	100	98	98	99	98	98	100
Southern region 1981	100	0	100	91	42	99	52	83	36	42	63	68	100	100	100	100	99	99	100	100	100	99	100	98	100	100
Colombia 1976	96	1	96	74	41	91	84	61	73	58	58	48	92	98	96	98	97	95	95	97	97	92	99	90	95	100
Colombia 1978	98	0	97	80	30	95	81	53	71	69	50	32	92	98	99	98	98	97	96	99	98	95	99	94	97	100
Colombia 1980	96	0	96	81	32	94	78	50	71	67	54	33	95	97	98	97	96	94	98	97	95	92	98	91	94	99
Costa Rica 1976	100	0	100	94	69	98	93	92	90	73	83	69	100	100	100	100	100	99	100	100	100	99	100	97	100	100
Costa Rica 1978	99	0	99	71	47	98	86	89	81	67	75	45	96	99	100	99	99	100	98	100	99	98	100	99	98	100
Costa Rica 1981	100	0	100	97	62	99	94	94	89	75	88	69	100	100	100	100	100	99	100	100	100	100	100	100	100	100
Dominican Rep. 1975	98	0	98	95	32	92	80	73	71	62	43	58	97	97	99	99	97	98	97	98	98	96	100	91	98	100
Dominican Rep. 1983	99	0	99	97	37	97	90	90	81	75	45	49	99	99	100	99	100	99	99	99	100	99	100	96	100	100

Region, Country & Year	% Knowing: Any Method	Traditional Only[a]	Any Modern[b]	Voluntary Sterilization: Female	Male	OCs	IUDs	Condoms	Injectables	Vaginal Methods	Rhythm	Withdrawal	% Knowing Any Method, by: Age: 15–19	20–24	25–29	30–34	35–39	40–44	No. of Living Children: 0–1	2–3	4+	Residence: Rural	Urban	Education: None	Less than Complete Primary	Complete Primary or More
Ecuador 1979	91	1	90	77	25	84	74	47	74	56	57	45	85	91	91	92	93	90	88	93	91	85	97	71	89	96
El Salvador 1978	99	0	99	97	82	98	94	88	74	45	34	26	99	100	99	99	100	100	99	100	99	99	100	99	100	100
Guatemala 1978	80	0	80	62	34	77	52	31	59	26	30	18	64	80	84	86	84	76	74	80	84	77	97	81	93	98
Guatemala 1983	83	0	83	71	49	80	57	40	62	41	30	14	76	82	85	82	86	82	78	85	83	79	97	70	89	98
Guyana 1975	96	0	95	81	23	80	83	71	41	43	45	45	90	96	97	98	94	95	94	96	96	95	98	84	90	96
Haiti 1977	85	3	82	39	15	75	52	53	†	31	56	50	88	89	85	86	79	85	85	86	85	80	99	80	96	99
Haiti 1983	86	0	86	29	14	81	35	77	50	26	19	26	86	83	86	88	91	82	83	87	90	83	96	80	93	97
Honduras 1981	94	0	93	81	19	91	69	37	72	30	25	14	90	93	94	96	94	92	93	93	94	91	99	87	94	99
Jamaica 1975–76	98	0	98	88	41	95	85	91	89	70	40	60	98	99	99	99	98	95	98	99	98	99	98	91	98	98
Jamaica 1983	100	0	100	93	47	100	85	98	98	76	45	56	100	100	100	100	100	98	100	100	100	100	100		100	100
Mexico 1976–77	90	0	90	69	39	83	76	42	70	48	49	48	81	90	93	92	91	87	89	91	90	80	97	75	89	97
Mexico 1978	94	0	94	73	31	91	77	33	75	46	42	28	86	94	95	96	94	94	92	95	95	88	97	84	92	99
Mexico 1979	90	0	90	72	3[c]	89	75	34	38[c]	23[c]	7[c]	1[c]	79	90	93	92	92	89	87	92	91	84	98	78	88	98
Panama 1976	99	0	99	94	66	96	90	76	27	58	66	61	[d]	99	100	99	98	98	100	98	99	98	100	95	97	99
Panama 1979–80	99	0	99	96	72	97	82	81	83	72	63	63	99	99	100	99	100	99	99	100	99	99	100	98	98	100
Paraguay 1977	96	2	94	41	0	92	77	55	57	24	29	44	95	94	98	98	96	94	97	97	95	95	100	93	95	99
Paraguay 1979	96	1	95	47	15	91	79	60	74	31	50	47	92	97	98	97	96	96	95	98	95	94	99	90	94	98
Peru 1977–78	84	4	79	61	20	65	44	41	63	32	57	42	78	85	87	87	81	81	81	87	82	63	95	62	82	97
Peru 1981	83	6	78	61	20	71	54	40	64	37	69	40	73	86	87	85	82	80	83	86	81	64	92	56	80	96
Trinidad & Tobago 1977	99	0	99	90	55	95	88	94	81	77	59	70	96	98	99	100	99	99	98	100	99	98	100	94	100	99
Venezuela 1977	99	1	98	88	32	94	89	78	9	55	61	61	99	99	98	99	98	98	99	99	98	95	99	94	98	99
MIDDLE EAST & NORTH AFRICA																										
Egypt 1980	90	0	90	43	6	90	71	26	16	14	14	10	79	88	92	94	92	91	85	92	93	85	98	86	95	98
Egypt (rural) 1980	91	0	91	27	6	91	70	12	†	7	6	4	82	90	92	94	94	92	85	92	95	91		88	95	98
Jordan 1976	97	0	97	79	19	96	77	51	†	22	52	56	96	97	98	98	97	98	96	97	98	94	99	95	99	100
Jordan 1983	100	0	100	92	63	99	98	36	60	39	71	71	99	99	100	99	100	100	99	100	100	99	100	99	100	100
Morocco 1979–80	84	1	83	51	†	82	55	32	4[c]	8	27	27	77	82	86	87	85	80	80	83	87	75	98	81	99	99
Morocco 1983–84	92	0	92	57	†	92	66	37	†	12	33	32	85	90	93	96	93	92	87	93	94	88	98	91	98	100
Syria 1978	79	1	78	29	9	77	42	29	16	45	43	34	73	78	79	81	82	79	73	80	81	64	93	69	96	97
Tunisia 1978	96	0	95	91	35	91	85	48	62	38	31	30	91	93	97	97	97	95	94	96	97	92	100	95	98	99
Tunisia 1983	98	0	98	94	25	96	91	61	66	64	51	48	100	98	98	99	98	98	97	99	98	97	99	98	99	100
Yemen Arab Rep. 1979	24	0	24	5	3	23	3	2	15	0	1	1	17	25	26	24	28	25	18	25	32	18	74	23	89	*

Note: In this and other tables, brackets around country names indicate comparable data in two or more surveys from the same country.

0 = <0.5

†Question not asked

*Fewer than 25 cases

[a]Includes douche, withdrawal, rhythm, abstinence, "other"

[b]Includes voluntary sterilization, oral contraceptives (OCs), intrauterine devices (IUDs), condoms, injectables, and vaginal methods (spermicides, diaphragms, and caps). Includes those who also knew of traditional methods.

[c]Spontaneous response only

[d]No women in category were included in survey

family planning with interviewers. According to an analysis of WFS data from Costa Rica, women said they had learned about contraception at about age 24, on average (236).

A relative lack of knowledge among older women was shown in Vaessen's study of WFS data from 19 countries. In roughly one-third of the countries, women age 45–49 were even less likely than 15–19 year old women to know of a method (292). These women may have passed through their peak reproductive years before information about family planning and the methods themselves became readily available. The relative lack of family planning knowledge among older women was confined to those over age 44. In Table 3 there is little evidence that women age 40–44, the oldest group shown, are less knowledgeable than others.

Number of children. Number of living children and knowledge of contraception do not appear to be related (see Table 3). In most countries the percentages of women who knew a method were similar for all parity groups, especially for the groups with two to three children and with four or more children. Countries where women with no children or one child were less likely to know of a method are also countries where young women were less likely to know of a method. Thus the link between knowledge and parity may reflect the fact that women with fewer than two children are usually very young.

Rural/urban residence. Urban women are more likely than rural women to know of a contraceptive method, but the differences are usually not great. In only about one-third of the surveys in Table 3 was the difference in knowledge between urban and rural women more than 10 percentage points. In general, differences were greater where overall levels of knowledge were low. The rural/urban difference is most striking in the 1979 survey in Yemen Arab Republic, where 74 percent of urban women knew of a method compared with only 18 percent of rural women.

Rural women may be less familiar with family planning because mountains, rivers, or long distances isolate them and make it more difficult for city-based organizations to provide family planning information and services. Also, urban areas expose people to a greater range and number of ideas, concepts, and products. Data from the Costa Rican WFS and from a resurvey of the WFS respondents showed that knowledge about family planning was closely linked to modern attitudes, especially modern attitudes about appropriate roles for men and women, and awareness of the world beyond one's community (236). The fact that urban women are better educated may also help to explain the rural/urban difference in knowledge of family planning.

Education. In general, the more education a woman has, the more likely she is to know of a contraceptive method. Some of the largest differences in knowledge by education were found in Botswana, Senegal, Nepal, Guatemala, and Peru. In these countries differences in knowledge between women with no formal education and women who had at least a primary school education ranged from 25 to 40 percentage points. The countries with the least widespread knowledge of contraception tended to have large differences in knowledge by education, suggesting that the most educated women are the first to learn about contraception. Better educated women have better access to print media, which report on family planning more often than other mass media. Less educated women—and women in rural areas—depend more on radio and interpersonal channels of communication for information. Except where family planning programs have made special efforts, radio usually has provided little information about family planning, and interpersonal communication about family planning is limited.

USE OF FAMILY PLANNING

In the 61 countries with WFS or CPS results, current use of family planning ranges from less than one percent of married women of childbearing age in Mauritania to 66 percent in Costa Rica. Latin American women are most likely to use contraception; African women, least likely. Almost everywhere except Africa, modern methods are more widely used than traditional methods. In most countries OCs are the most common method, followed by voluntary female sterilization and IUDs. Where several surveys have been conducted in one country, contraceptive use is generally increasing, and female sterilization is one of the fastest growing methods. Contraceptive use is most common among urban women age 30–39 with two or more children and at least some primary school education.

Current Use

Differences in contraceptive use among countries and regions are striking. In all but 3 of the 11 African countries with national data, prevalence was below 20 percent at the time of the survey. In all but one of the 18 Latin American countries with national data, prevalence was above 20 percent, and in 9 countries, above 40 percent. The 10 Asian countries surveyed were divided almost equally among low, medium, and high prevalence levels. Four of the six Middle Eastern countries were in the middle range. (See Table 4.) In all 17 developed countries with available data, prevalence was well over 40 percent (see Table 5). The distribution is summarized below:

Region	Number of countries with prevalence: under 20%	20–40%	over 40%
Sub-Saharan Africa	8	3	0
Asia & Pacific	3	3	4
Latin America & Caribbean	1	8	9
Middle East & N. Africa	1	4	1
Europe & US	0	0	17

The developing countries with the highest levels of contraceptive use are in Latin America and Asia. In Latin America contraceptive prevalence was over 50 percent in Colombia (1980), Costa Rica, Jamaica (1983), Panama, Trinidad and Tobago, and the southern states of Brazil. In Asia prevalence was over 50 percent in South Korea (1979), Sri Lanka (1982), Thailand (1978, 1981), parts of Indonesia and, as measured by a different survey, in China, where prevalence reached 69 percent in 1982 (508). The lowest prevalence rates are found largely in Africa—under 5 percent in Cameroon, Ivory Coast, Mauritania, Senegal, and Somalia, and, in the Middle East, in Yemen Arab Republic. Among African countries with national data, the highest prevalence was in Zimbabwe, at 40 percent; Botswana, at 29 percent; and Benin, at 20 percent. The 1984 CPS in Kenya, for which full data are not yet available, found that 12 percent of married women age 15–49 were using contraception (701).

Table 4. Use of Contraceptives Among Currently Married Women Age 15–44, by Characteristics of the Women, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	% Ever Using			% Now Using	% of Exposed[c] Women	% Now Using Any Method, by:																			
						Age						No. of Living Children			Residence		Education			Rural Women, by No. of Children			Urban Women, by No. of Children		
	Any Method	Any Traditional[a]	Any Modern[b]	Any Method	Now Using Any Method	15–19	20–24	25–29	30–34	35–39	40–44	0–1	2–3	4+	Rural	Urban	None	Less than Complete Primary	Complete Primary or More	0–1	2–3	4+	0–1	2–3	4+
AFRICA																									
Benin 1981–82	36	35	3	20	26	12	19	21	22	20	18	12	22	25	19	22	19	29	24	11	20	24	13	26	26
Botswana 1984	56	32	40	29	NA	20	33	34	34	26	15	23	32	32	26	38	21	24	39	21	28	29	26	45	47
Cameroon 1978	11	10	3	3	3	2	3	3	2	2	2	2	3	2	2	6	1	3	7	2	2	2	4	8	6
Ghana 1979–80	41	32	19	10	13	5	8	12	13	10	9	7	12	11	8	14	6	12	16	6	8	9	10	18	13
Ivory Coast 1980–81	70	70	3	3	4	2	4	3	5	2	2	2	4	3	2	5	2	4	10	2	2	2	3	6	5
Kenya 1977–78	32	24	13	7	9	2	6	6	10	7	10	2	7	9	6	13	4	5	11	2	6	8	5	15	19
Lesotho 1977	24	21	7	5	7	2	3	8	8	9	3	2	7	9	5	7	2	4	6	2	7	9	1	9	18
Mauritania 1979	2	1	1	1	1	0	0	1	2	1	1	0	1	1	1	1	0	2	1	1	1	1	0	1	1
Nigeria 1981–82	14	13	2	5	6	4	6	4	5	4	4	3	5	6	4	5	3	6	9	2	5	6	3	5	7
Senegal 1978	11	10	2	4	5	5	3	6	4	4	2	4	4	4	4	4	3	6	13	4	4	4	4	5	4
Senegal (Sine-Saloum) (rural) 1982	2	1	0	1	1	0	1	1	1	1	1	0	1	1	1		2	*	*	0	1	1			
Somalia (urban) 1983																									
Baydhaba	1	0	1	1	NA	0	0	1	1	2	0	1	0	1		1	0	1	2				1	0	1
Hargeisa	4	3	2	3	NA	4	7	2	3	4	0	1	4	4		3	2	4	11				1	4	4
Kismayu	1	0	1	0	NA	0	1	1	0	0	0	0	1	1		0	0	2	0				0	1	1
Mogadishu	1	0	1	1	NA	0	1	0	2	2	0	0	1	1		1	0	1	1				0	1	1
Sudan (north) 1978–79	13	6	10	5	7	4	4	7	5	4	4	4	5	5	2	12	2	11	20	3	2	2	7	15	13
Zaire (urban) 1982–84																									
Kananga	40	35	10	12	NA	10	11	9	7	18	20	9	8	16		12	10	13	11				9	8	16
Kinshasa	69	66	23	36	NA	39	40	37	29	42	21	36	33	39		36	24	33	40				36	33	39
Kisangani	50	50	13	19	NA	19	17	23	17	15	21	13	20	24		19	11	12	26				13	20	24
Lubumbasi	67	61	26	37	NA	34	36	37	44	39	17	30	37	42		37	28	32	41				30	37	42
Zimbabwe 1984	67	44	49	40	NA	25	44	42	43	37	38	25	43	48	36	47	27	39	49	23	36	43	28	56	59
ASIA & PACIFIC																									
Bangladesh 1975–76	15	9	8	8	10	4	8	9	12	12	9	4	8	12	7	19	6	10	16	3	7	11	9	18	28
Bangladesh 1979–80	22	6	18	13	NA	6	11	15	18	18	16	6	14	19	12	22	10	17	32	6	13	18	11	24	28
Fiji 1974	71	34	60	42	52	21	32	41	50	51	45	18	41	58	39	48	49	50	40	14	35	56	23	51	65
Indonesia (Java & Bali) 1976	40	11	36	28	37	13	27	33	34	30	23	13	34	36	27	31	24	29	36	14	34	34	8	35	46
Indonesia (urban) 1983 Jakarta	60	11	56	44	NA	21	35	44	55	51	40	19	53	54		44	19	31	54				19	53	54

Table 4 (continued). Contraceptive Use and Characteristics of Women

Region, Country & Year	% Ever Using: Any Method	% Ever Using: Any Traditional[a]	% Ever Using: Any Modern[b]	% Now Using Any Method	% of Exposed[c] Women Now Using Any Method	Age: 15–19	Age: 20–24	Age: 25–29	Age: 30–34	Age: 35–39	Age: 40–44	No. of Living Children: 0–1	No. of Living Children: 2–3	No. of Living Children: 4+	Residence: Rural	Residence: Urban	Education: None	Education: Less than Complete Primary	Education: Complete Primary or More	Rural Women, by No. of Children: 0–1	Rural Women, by No. of Children: 2–3	Rural Women, by No. of Children: 4+	Urban Women, by No. of Children: 0–1	Urban Women, by No. of Children: 2–3	Urban Women, by No. of Children: 4+
Indonesia (cont.)																									
Medan	53	14	46	36	NA	11	22	35	44	52	36	12	37	47		36	18	29	41				12	37	47
Semarang	69	11	66	54	NA	38	48	59	59	60	49	30	64	66		54	31	51	63				30	64	66
Surabaya	62	15	58	47	NA	18	37	51	57	55	38	19	59	59		47	18	36	56				19	59	59
Ujung Pandang	45	9	41	33	NA	8	26	35	39	39	36	11	36	44		33	12	27	42				11	36	44
Korea, Rep. of 1974	61	26	56	37	46	13	13	28	45	54	38	11	44	47	33	40	37	37	38	7	32	42	12	48	52
Korea, Rep. of 1979	76	29	71	55	NA	11	19	41	69	72	53	17	64	64	54	55	51	56	55	13	57	63	18	67	65
Malaysia (peninsular) 1974	53	23	43	35	NA	15	29	39	39	38	34	20	38	41	30	47	26	34	41	16	31	35	28	50	55
Nepal 1976	4	1	4	3	3	0	1	3	5	5	3	1	2	6	2	21	2	6	13	0	2	5	13	24	25
Nepal 1981	9	0	9	7	NA	0	3	6	11	10	11	1	7	15	6	23	6	14	26	1	6	14	5	26	40
Pakistan 1975	10	2	9	5	7	0	2	5	7	10	7	1	4	9	3	12	4	11	14	1	2	5	2	10	20
Philippines 1978	61	47	43	39	48	16	29	39	43	46	37	20	43	43	33	50	11	24	42	15	36	37	28	56	57
Sri Lanka 1975	47	29	29	34	41	13	20	30	43	41	35	15	38	43	32	40	22	27	39	13	36	41	20	43	53
Sri Lanka 1982	69	45	43	57	NA	28	41	52	64	71	65	33	64	70	57	59	48	55	61	32	63	69	36	69	75
Thailand 1975	50	17	44	36	46	18	31	41	42	41	29	23	42	40	34	48	31	34	37	20	40	37	34	49	61
Thailand 1978	73	15	69	52	NA	31	43	54	60	61	49	45	59	58	50	60	53	52	54	44	57	56	50	67	78
Thailand 1981	80	16	76	59	NA	29	48	61	68	69	56	37	69	67	58	65	54	59	62	36	67	65	41	77	82
LATIN AMERICA & CARIBBEAN																									
Barbados 1980–81	75	11	74	47	NA	28	45	54	59	65	34	38	56	61	—47[d]—		*	43	48				38[d]	56[d]	61[d]
Bolivia 1983	35	25	19	26	NA	13	24	29	26	28	24	21	30	25	13	43	8	16	44	10	12	15	32	50	43
Brazil																									
Amazonas (urban) 1982	70	4	66	53	66	21	41	54	61	72	52	32	62	61		53	27	38	60				32	62	61
Northeast region 1980	59	6	53	37	50	18	30	40	43	41	40	24	46	40	26	45	23	36	53	17	31	29	28	55	51
Piauí 1979	49	9	40	31	42	16	22	32	37	38	34	17	36	37	26	43	23	29	47	17	27	30	17	53	53
Piauí 1982	52	3	48	35	46	15	24	35	41	43	40	16	39	43	25	48	23	33	47	12	24	32	21	58	63
São Paulo 1978	87	7	79	66	77	43	61	64	70	76	62	51	74	71	59	67	55	63	68	42	67	60	53	75	74
Southern region 1981	88	7	81	66	78	45	65	68	71	70	61	52	77	66	61	69	57	63	70	49	74	58	53	78	72
Colombia 1976	64	37	53	45	54	27	41	46	57	47	40	30	51	49	28	54	25	35	58	15	26	35	37	62	60
Colombia 1978	67	22	60	48	NA	21	42	51	55	55	49	32	58	51	31	58	27	46	58	19	35	35	38	66	65
Colombia 1980	71	23	64	51	NA	25	44	54	61	61	45	33	61	55	39	56	32	43	61	23	42	43	36	68	63
Costa Rica 1976	87	44	78	67	79	e	63	68	69	71	64	51	74	71	64	70	59	64	69	50	68	68	52	78	76
Costa Rica 1978	84	31	79	66	NA	48	59	67	74	70	67	49	75	71	62	69	56	64	68	40	72	67	54	76	77
Costa Rica 1981	89	42	83	66	NA	47	58	65	72	76	70	50	71	74	63	69	68	62	68	49	67	68	51	75	83

Dominican Rep. 1975	52	33	41	33	43	13	27	41	41	40	28	16	40	40	23	42	18	27	42	9	25	29	21	50	53
Dominican Rep. 1983	70	19	67	47	NA	19	36	50	57	59	48	22	52	60	42	51	37	46	64	15	44	55	26	57	67
Ecuador 1979	55	31	44	35	44	14	29	37	43	42	35	21	42	37	23	48	12	21	45	11	27	26	29	56	55
El Salvador 1978	47	2	45	34	44	8	33	44	38	41	29	20	42	37	26	48	24	35	50	15	29	30	26	54	59
Guatemala 1978	28	2	27	18	23	5	12	21	24	28	14	11	21	20	13	41	12	23	51	7	14	16	24	51	42
Guatemala 1983	37	4	33	25	32	9	16	30	32	31	28	15	33	23	19	49	10	25	54	12	24	18	27	59	54
Guyana 1975	57	25	50	35	41	15	27	37	47	41	35	16	37	44	33	41	34	35	35	12	30	43	24	51	45
Haiti 1977	37	34	12	19	25	17	15	18	23	15	27	12	24	25	15	28	14	27	36	8	20	19	19	34	44
Haiti 1983	19	9	15	7	NA	4	5	7	8	9	10	4	8	11	6	13	4	6	23	2	6	9	8	16	22
Honduras 1981	43	8	40	27	NA	8	23	31	33	32	29	18	29	30	17	47	12	24	46	6	17	20	30	48	60
Jamaica 1975–76	69	32	61	40	47	31	39	43	50	43	32	29	42	49	35	46	16	32	41	22	31	45	34	51	56
Jamaica 1983	76	12	74	52	NA	34	49	59	56	58	59	39	61	64	51	53		56	51	37	60	62	41	62	65
Mexico 1976–77	48	28	38	32	42	14	27	39	38	38	25	19	39	34	15	45	14	25	46	8	15	17	26	54	49
Mexico 1978	58	19	51	42	NA	24	42	45	52	43	34	33	52	44	26	51	23	35	59	17	35	26	38	59	56
Mexico 1979	52	9	47	40	NA	20	38	45	50	43	34	25	48	43	29	52	23	34	55	15	34	33	34	59	58
Panama 1976	76	37	66	55	65		44	59	57	58	56	38	60	58	47	61	39	43	58	30	52	48	41	65	71
Panama 1979–80	78	4	74	61	72	29	49	62	70	74	69	42	70	67	55	67	41	60	64	30	64	59	48	75	79
Paraguay 1977	48	19	30	31	42	14	26	33	35	33	39	25	39	31	24	54	27	27	45	15	29	26	44	59	61
Paraguay 1979	59	31	46	39	49	19	36	44	41	41	38	30	52	34	28	52	22	25	46	20	36	28	39	65	50
Peru 1977–78	52	45	25	34	42	17	29	37	41	35	29	22	40	33	12	45	13	26	50	6	14	13	30	51	47
Peru 1981	63	51	34	43	NA	22	38	46	52	48	37	33	50	42	23	53	19	36	56	18	26	22	40	59	54
Trinidad & Tobago 1977	82	42	78	55	65	32	48	59	63	62	45	32	65	63	55	56	44	52	56	27	62	64	35	67	62
Venezuela 1977	70	37	59	49	60	29	45	53	56	55	49	34	58	52	29	54	32	40	55	15	40	28	36	62	61
MIDDLE EAST & NORTH AFRICA																									
Egypt 1980	41	7	40	25	31	4	13	24	33	34	33	9	29	33	12	41	16	27	40	3	11	21	19	48	53
Egypt (rural) 1980	29	2	28	16	NA	2	8	15	22	25	20	3	16	25	16		13	17	31	3	16	25			
Jordan 1976	48	31	40	26	37	9	17	26	32	33	33	11	27	30	8	34	14	28	37	1	9	10	15	34	39
Jordan 1983	45	5	41	26	43	4	17	25	33	30	32	8	28	30	13	32	16	27	34	2	15	14	10	33	37
Morocco 1979–80	32	9	29	20	29	10	17	21	25	23	22	10	19	27	10	39	16	34	54	5	8	14	19	39	49
Morocco 1983–84	48	14	44	27	NA	11	22	25	36	29	28	12	30	33	16	44	22	42	56	6	15	23	24	51	51
Syria 1978	34	19	30	20	29	9	15	19	24	31	24	8	22	25	6	35	10	37	38	3	5	7	13	39	42
Tunisia 1978	47	20	41	32	42	8	17	29	39	41	38	12	31	42	20	46	28	41	42	5	13	30	21	48	56
Tunisia 1983	60	20	55	42	NA	19	30	37	40	51	50	16	42	50	29	55	36	46	59	8	22	37	22	57	67
Yemen Arab Rep. 1979	3	0	3	1	2	0	1	2	1	2	1	0	1	3	0	7	1	10	*	0	1	1	2	5	11

0 = <0.5
NA = Not available
*Fewer than 25 cases

[a]Includes douche, withdrawal, rhythm, abstinence, and "other," except surveys conducted by the US Centers for Disease Control (US CDC), which include only withdrawal and rhythm. US CDC surveys treat douche, abstinence, and "other" as no method.

[b]Includes voluntary sterilization, oral contraceptives (OCs), intrauterine devices (IUDs), condoms, injectables, and vaginal methods (spermicides, diaphragms, and caps)

[c]Currently married, nonpregnant, and fecund women including women sterilized for contraceptive purposes. Data on exposed women are included for purposes of comparison with other publications; this category is no longer frequently used.

[d]Sample is combined rural/urban; no breakdown is available. In 1980 approximately 60 percent of the population was rural (669).

[e]No women in category were included in survey.

Contraceptive use clearly is increasing. Prevalence increased in 16 of 19 areas with data from more than one comparable survey—Bangladesh, Nepal, South Korea, Sri Lanka, Thailand, Piauí (Brazil), Colombia, the Dominican Republic, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, Morocco, and Tunisia (see Table 4). In these 16 areas, contraceptive use increased by about one to 4 percentage points per year. Only in Jordan did contraceptive use remain steady at a low level between the surveys shown on Table 4. In Costa Rica there was essentially no change between 1976 and 1981, but 67 percent of women were already using contraception in 1976—a level similar to those in developed countries. In Haiti contraceptive use appeared to decrease between the 1977 WFS and the 1983 CPS. Most of the decrease is due to less reported use of rhythm and withdrawal. CPSs did not explain methods in detail to respondents, while WFS did—a difference that particularly affected answers about traditional methods (478) and may help explain the apparent trend in Haiti.

In 17 developed countries that participated in WFS, levels of contraceptive use among married women of reproductive age ranged from 51 percent in Spain to 75 percent or more in seven countries (see Table 5).

Ever-Use

The percentages of married women of childbearing age who have ever used contraception vary just as much among countries and regions as the percentage currently using contraception. Ever-use ranged from 2 percent in Mauritania to 89 percent in Costa Rica (see Table 4).

A comparison of current use with ever-use very roughly indicates whether the average contracepting couple uses contraception briefly (large difference) or for an extended period (slight difference). The smallest differences between current use and ever-use were in Asia and Latin America; the largest differences, in Africa. In Asian and Latin American countries current users averaged about two-thirds of ever-users, reflecting the high prevalence of voluntary female sterilization. In Middle Eastern countries current users averaged about 55 to 60 percent of ever-users. In African countries, however, current users averaged about 35 percent of ever-users. Despite widespread ever-use of traditional methods in some countries, relatively few African women reported that they were currently using traditional methods. In Africa postpartum abstinence accounts for most of the use of traditional methods. Postpartum abstinence is often brief—for example, six months while breast-feeding or during a stay with parents. It is not clear how much the desire to avoid pregnancy motivates postpartum abstinence. It may also be motivated by cultural traditions.

In most countries many more women had ever used a modern method than a traditional method. In Asia women

Table 5. Use of Contraceptives as Determined in Representative Sample Surveys, Total Fertility Rates, and Crude Birthrates, Developed Countries, 1975–83

Country	Ref. No. of Survey Report	Date of Field Work	% Currently Using Contraception[a]										TFR	CBR
			Any Method	Voluntary Sterilization Female	Voluntary Sterilization Male	OCs	IUDs	Condoms	Vaginal Methods	Rhythm	Withdrawal	Other		
Belgium (Flemish part)	77	1975–76	85	5	0	32	3	7	1	13	23	0	1.6	12
Bulgaria	354, 573	1976	76	1	1	2	2	2	0	4	60	6	2.1	15
Denmark[b]	644	1975	63[c]	NA	NA	22	9	25	4	1	1	2	1.5	10
Finland	632	1977	80	4	1	11	29	32	1	1	2	NA	1.6	14
France	87	1977–78	71	4	NA	24	9	6	1	6	21	NA	1.8	14
Hungary[c]	92, 556	1977	74	1	NA	36	10	4	1	4	17	1	2.0	13
Italy	94, 519, 520	1979	78	1	NA	14	2	13	2	9	36	1	1.6	11
Netherlands[d]	107	1975	75	2	2	50	5	11	1	3	2	1	1.4	12
Netherlands[e]	672	1982	78	8	11	38	10	7	NA	NA	NA	3	1.4	12
Norway	109, 611, 614	1977–78	71	4	2	13	28	16	2	3	4	0	1.7	12
Poland[b]	651	1977	75	NA	NA	8	2	14	3	31	19	0	2.3	19
Portugal[f]	55, 56, 115	1979–80	70	1	0	22	4	6	5	4	25	3	2.3	18
Romania	607	1978	58	NA	NA	1	NA	3	1	24	26	3	2.4	17
Spain	117, 652	1977	51	0	NA	13	1	5	1	6	22	3	2.2	15
Switzerland[g]	553	1980	70	——15——		26	11	8	NA	4	2	3	1.9	11
United Kingdom (England, Wales, & Scotland)	524	1976	77	8	8	28	7	18	2	1	5	NA	1.8	13
United States[f,h]	606	1976	68	10	9	23	6	7	6	3	2	2	1.8	16
United States[f,h]	626	1982–83	68	17	10	13	5	10	7	3	1	1	1.8	16
Yugoslavia	692	1976	55	NA	NA	5	2	2	3	4	36	3	2.0	15

0 = <0.5
NA = Not available

[a]Among currently married, once-married women below age 45, except where noted
[b]Data include women married more than once and exclude sterilization
[c]Data are for all women below age 40
[d]Data are for currently married women who married 1963–73
[e]Data are for currently married (not separated) and cohabiting women born 1945–64
[f]Data are for currently married women age 15–44
[g]Responses are of wives in survey of couples
[h]Excludes Alaska, Hawaii, and women in institutions

Source: Survey data from Berent (251), except Switzerland: Hopflinger & Kuhne (553), United States 1976: Mosher (606); United States 1982–83: Pratt et al. (626), and Netherlands 1982: Van de Giessen (672); Portuguese contraceptive use tabulated from WFS data tapes. Total fertility rates (TFR) and crude birth rates (CBR) for 1982 from World Bank (703).

were over three times as likely, on average, to report having used a modern method as a traditional method; in the Middle East, four times as likely; and in Latin America, five times as likely. Africa is the exception. In 9 of the 14 countries surveyed, traditional methods had been used much more than modern ones. Particularly striking is the Ivory Coast, where 70 percent had used a traditional method, mainly abstinence, but only 3 percent had ever used a modern method. Traditional methods include withdrawal, rhythm, abstinence, douches, or herbs, except in surveys conducted through US CDC (see Table 1). These surveys considered abstinence, douches, and herbs the same as no method.

Of course, in every country some women had used both traditional and modern methods. This percentage can be calculated by adding the percentages using modern and traditional methods and subtracting from this sum the percentage using any method (see Table 4). For instance, in Morocco (1983–84), 14 percent of women had used a traditional method, 44 percent a modern method, and 48 percent any method. Thus 10 percent of the women had used both a traditional and a modern method. Surprisingly, a United Nations analysis found that, in 11 of 15 WFS surveys in Asia and Latin America, at least one-quarter of the women who were using a traditional method when interviewed had previously used a modern method (667). This finding suggests that women shift between modern and traditional methods over their lifetimes depending on their preferences at the time, their experience with various methods, and the availability of methods.

Women's Characteristics and Use of Contraception

Certain women are more likely to use family planning than others. In most countries surveyed these women can be identified quite consistently by age, family size, education, and urban/rural residence.

Age. Typically, current use of contraception is most common among women age 30–39. It is least common among the youngest women, gradually increasing and peaking during the mid to late childbearing years, then dropping off among the oldest women (see Table 4).

Older women (age 40–44) are less likely to use family planning than younger women, especially in Latin America. For instance, in Barbados, Colombia (1980), the Dominican Republic, El Salvador, Peru (1981), and Trinidad and Tobago, current use was at least 10 percentage points less for those age 40–44 than for those age 30–34. On one hand, this pattern could mean that women stop using contraception as they grow older. Older women are less fecund and have intercourse less frequently. Therefore they may feel less need for contraception. On the other hand, the pattern no doubt reflects the long-term trend toward greater contraceptive use. Each subsequent group of women born in a 5-year period is more likely to use contraception than groups born in earlier periods. Older groups passed through their peak reproductive years when contraceptives were less available and less accepted. Therefore they are less likely to know about and to use contraception. With time—and especially with the growing use of voluntary female sterilization—levels of contraception among older women are likely to increase.

Number of children. Use of contraception is also more common after at least two or three children. Rates of contraceptive use increase sharply as parity rises from zero to three children but remain fairly steady thereafter. After three children the association of older age with less contraceptive use may counterbalance the effect of parity (667). Of course, parity and age are closely related. In several studies age and parity each strongly influenced contraceptive use, however, even after taking into account various combinations of other variables—for instance, the woman's education, her knowledge of a source of contraception, the couple's standard of living, and whether they live in a rural or urban area (179, 188, 218, 232, 609).

Enrique Carrasco has identified three patterns of contraceptive use seen in different countries. In the first pattern, relatively few women use contraception. Older women with large families are the most likely to use contraception. Nepal is an example. This pattern is common in countries with weak or only recently established family planning programs. In the second pattern, many women in every age group use contraception. Use is common even among women with few children because women use contraception to space births as well as to end childbearing. This pattern is common in more developed areas where family planning services and supplies are widely available, such as Costa Rica and southern Brazil. The third pattern is in-between. Overall prevalence is moderate. Older women use contraception to terminate childbearing. Mainly in cities, some young and low-parity women have begun to use contraception to space births. Fiji and Jordan are examples (254).

Education. In most countries the better educated a woman is, the more likely she is to use contraception (280, 567, 612, 664, 667, 678) (see Table 4). Part of the relationship between education and contraceptive use may be due to the greater availability of family planning services in urban areas, where well-educated women tend to live (see below). Education makes no difference to the choice of a modern method over a traditional one, however. While well-educated women are more likely than less educated women to use a modern method, they are also more likely to use a traditional method (280, 678). Surveys also have found that, when the husband is well-educated, the couple is more likely to use contraception, regardless of the wife's level of education (612, 667).

According to a UN analysis of WFS data, education made the least difference to contraceptive use where family planning programs were strong or where levels of socioeconomic development were high (664). The fact that some of these countries with strong programs did not have high levels of development suggests that strong programs can facilitate contraceptive use among the less educated and make possible higher overall levels of contraceptive use (667).

Rural/urban differences. In nearly every country urban women are more likely to use contraception than rural women (272, 280, 567, 612, 664, 667, 678). Rural/urban differences were larger in the Middle East and Latin America than in sub-Saharan Africa and Asia (see Table 4). Like education differentials, rural/urban differences were usually smaller where levels of use were very low, as in Africa, or very high, as in southern Brazil, Costa Rica, South Korea, and Sri Lanka. Rural/urban differences were larger in countries with moderate prevalence levels, where many

urban women were beginning to use contraceptives, but few rural women did as yet.

Rural/urban differences in contraceptive use appear to stem both from differences in the characteristics of women and from better access to family planning services in urban areas. Rural/urban differences are partly explained by taking into account that rural women are less educated on average than urban women (667). They also are explained to some extent by taking into account the occupations of husband and wife. Nonetheless, even after also taking account of differences in age, family size, and the desire for more children, rural/urban differences persist (664, 667).

Lack of access to services is an important reason for the rural/urban difference in use of contraception. Rural women are less likely than urban women to know of a source of family planning. Not surprisingly, the farther a woman lives from a source, the less likely she is to know of a source (see p. M-316).

One exception to the usual rural/urban pattern is Jakarta, Indonesia. The 1976 WFS found less use of contraception in this urban area than in other provinces with large rural populations. This difference probably resulted from the rural emphasis of the national family planning program at the time (23, 24). It suggests that family planning programs can be designed to overcome rural constraints to family planning use.

Surveys have often found that within a country certain ethnic or religious groups are more likely to use contraception than others. Examples include Thailand, where

The Demographic and Health Surveys Project

The Demographic and Health Surveys project (DHS), the successor to the World Fertility Survey and the Contraceptive Prevalence Surveys, is a 5-year project to help developing countries conduct and analyze surveys on population and health. The project began in September 1984. It is funded by the United States Agency for International Development (US AID) and is administered by Westinghouse Public Applied Systems (WPAS). The Population Council is a major subcontractor.

The DHS project has four main objectives:

- to provide decision-makers in participating countries with data useful for informed policy choices;
- to expand the international population and health database;
- to advance survey methodology;
- to develop in participating countries the skills and resources necessary to conduct high-quality demographic and health surveys.

The DHS project is conducting 35 surveys in 31 countries. Thirty-one surveys ask a wide range of fertility- and health-related questions. Four surveys are in-depth investigations of specific topics yet to be selected. Each of the surveys is conducted through a host-country executing agency with technical support from the DHS staff. Field work for the first Demographic and Health Survey, in El Salvador, was completed in July 1985. Design work has proceeded for surveys in Brazil, Liberia, Mexico, Nigeria, Peru, and Senegal. Negotiations are underway in Trinidad and Tobago, Ghana, Indonesia, Mali, and Sri Lanka. In addition, many other countries have expressed interest. The DHS project focuses on Africa, with as many as half of the surveys to be conducted there.

In most countries DHS is interviewing women age 15–44, regardless of marital status. The DHS core questionnaire includes questions on the background of the respondent and, as appropriate, her spouse or partner; maternity history; breast-feeding; maternal and child health; knowledge and use of contraception; marital history; and fertility preferences. Among the information gathered on child health are vaccination histories and whether diarrhea occurred within the preceding two weeks, plus what treatment the child received, if any. Optional modules cover health, socioeconomic conditions and status, female employment, the value of children, economic decision-making in the household, migration, Natural Family Planning, family structure, and community variables.

The DHS project emphasizes dissemination of findings. Researchers in the host country write a preliminary report to be made available to administrators and policy-makers within a few months after the field work is finished. A final report follows. (In the El Salvador survey, field work was finished in early July 1985 and tabulations for program planning purposes were delivered by the end of the month.) Plans include presenting findings to family planning and health care program professionals, researchers, and the communication media through in-country and regional seminars. The Population Council plans a special section, "New Data," in the periodical *Studies in Family Planning* to report progress and findings from DHS studies. A data archive at WPAS consists of a data tape and supporting documentation for each completed survey. In addition, DHS will create standard recode tapes.

The DHS project includes 25 further analyses of DHS and related data, to be carried out at institutions in participating countries with technical assistance from the Population Council. The objective is to stimulate high-quality analyses while building host-country capacity for population and health research (472).

Further information is available from:

Project Director
Demographic and Health Surveys
Westinghouse Public Applied Systems
P.O. Box 866
American City Building, No. 400
Columbia, Maryland 21044, USA

or

DHS Subcontract Manager
The Population Council
One Dag Hammarskjold Plaza
New York, New York 10017, USA

Buddhists were more likely to use contraception than Moslems; Guatemala, where Ladinos (non-Indians) were more likely to use than Indians; and Sri Lanka, where Sinhalese were more likely to use than Tamils or Moors (449, 473, 477, 483, 608). In the rural south of Thailand, Moslems used contraception less than Buddhists in part because Moslems wanted more children (449). Apparent ethnic differences are not always due to cultural traditions, however. WFS data from Sri Lanka in 1975 suggest that Sinhalese women used contraception more than Tamils or Moors because the Sinhalese had better access to family planning services (608).

Employment. There is some evidence that women who have been employed are more likely to use contraception than other women. In surveys in developing countries, it is difficult to define employment, however. Work is often temporary, not for cash, or in family homes or farms (612). Studies have found that women who have worked outside the home for cash payment are more likely to use contraception than women who have never worked outside the home. There is little evidence, however, that women with other kinds of work experience—on the family farm, for instance—are more likely to use contraception than women who have never worked (280, 612, 678).

Contraceptive Methods Used

When surveyed, currently contracepting women were most often using OCs, voluntary female sterilization, or IUDs (see Table 6). In over 80 percent of the countries, at least half of all users chose these methods. These methods were especially prevalent in Latin America and the Caribbean, where they were used by more than 70 percent of contraceptors in 11 of 18 countries. Worldwide, OCs were the most widely used method in the majority of developing countries surveyed.

Some notable exceptions to the general pattern are Peru, where, in 1981, 42 percent of contraceptive users were relying on rhythm while only 12 percent were using OCs, the second most prevalent method; Nepal, the only country where male sterilization was the most prevalent method, relied on by 43 percent of all users, but where overall prevalence is low; and Trinidad and Tobago, where nearly as many contracepting couples used condoms (31 percent) as used OCs (35 percent).

The predominance of modern methods in developing countries resembles patterns of contraceptive use in the US and many countries of Western Europe, although a relatively larger percentage of contraceptive users rely on condoms in some Western European countries. In contrast, traditional methods are much more widely used in Eastern Europe. Together, rhythm and withdrawal account for more than half of the contraceptive use in five of six Eastern European countries and in Italy (see Table 5). This pattern may reflect the fact that in much of Eastern Europe modern methods still are not widely available.

The number of children a woman has influences her choice of a family planning method. OCs are the method used most often by low-parity women (254, 691), who may want more children and so prefer a method that can be reversed simply by taking no more pills. In general, few women use IUDs before they have at least two children. Use of voluntary sterilization generally increases as parity increases, of course, since the more children a woman has, the less likely she is to want any more. In some countries, such as Panama and the Dominican Republic, a substantial percentage of women chose voluntary ster-

Figures 2, 3, and 4. Younger women tend to use OCs while older women use IUDs or voluntary sterilization. The age pattern in northeast Brazil is typical of many countries. In Zimbabwe younger women use mainly OCs and traditional methods, whereas older women also use voluntary female sterilization and injectables to a limited extent. In South Korea no single method predominates, although young women prefer OCs and nearly half of women in their 30's rely on voluntary female sterilization. Neither Zimbabwe nor South Korea is typical of its region.

Figure 2. Use of Contraception Among Currently Married Women Age 15–44, by Method and Age Group, Northeast Brazil, 1980

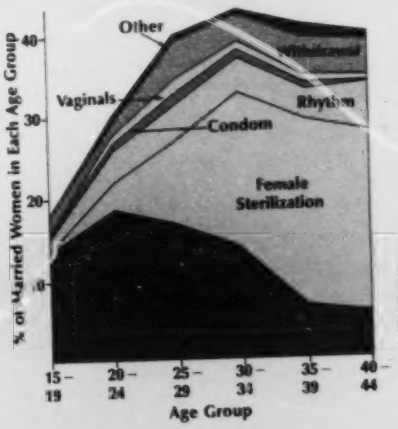


Figure 3. Use of Contraception Among Currently Married Women Age 15–44, by Method and Age Group, Zimbabwe, 1984

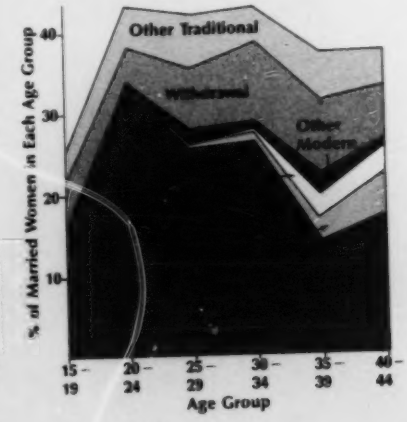
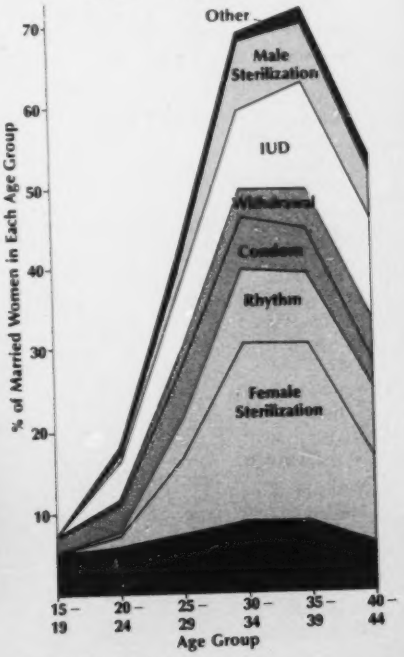


Figure 4. Use of Contraception Among Currently Married Women Age 15–44, by Method and Age Group, Republic of Korea, 1979



Note: Fewer than 25 users age 15–19

Table 6. Use of Contraception Among Currently Married Women Age 15–44, by Method, and Age 35–44 Currently Using Any Method or Voluntary Sterilization, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	% Using: Any Method	Any Tradi-tional[1]	Any Modern[2]	Voluntary Sterilization Female	Voluntary Sterilization Male	OCs	IUDs	Condoms	Injec-tables	Vaginal Methods	Rhythm	With-drawal	Age 35–44 Any Method	Age 35–44 Sterilization Female	Age 35–44 Sterilization Male
AFRICA															
Benin 1981–82	20	19	1	0	0	0	0	0	0	0	2	3	19	0	0
Botswana 1984	29	10	19	1	0	11	5	1	1	0	0	0	21	5	0
Cameroon 1978	3	2	1	0	0	0	0	0	0	0	1	0	2	0	0
Ghana 1979–80	10	4	6	0	0	3	0	1	0	2	1	0	10	1	0
Ivory Coast 1980–81	3	3	1	0	0	0	0	0	0	0	0	0	2	0	0
Kenya 1977–78	7	2	4	1	0	2	1	0	1	0	1	0	8	1	0
Lesotho 1977	5	3	3	1	0	1	0	0	0	0	0	3	6	2	0
Mauritania 1981	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Nigeria 1981–82	5	4	1	0	0	0	0	0	0	0	0	0	4	0	0
Senegal 1978	4	3	1	0	0	1	1	1	0	0	1	0	3	0	0
Senegal (Sine-Saloum) (rural) 1982	1	1	0	0	0	0	0	0	0	0	0	0	2	0	0
Somalia (urban) 1983															
Baydhaba	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Hargeisa	3	2	1	0	0	1	0	0	0	0	0	0	2	0	0
Kismayu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mogadishu	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Sudan (north) 1978–79	5	1	4	0	0	3	0	0	0	0	1	0	4	1	0
Zaire (urban) 1982–84															
Kananga	12	9	3	1	0	1	0	0	0	0	2	1	19	5	0
Kinshasa	36	32	4	0	0	1	1	0	1	0	15	7	33	2	0
Kisangani	19	2	16	0	0	0	1	0	0	0	5	3	17	1	0
Lubumbashi	37	29	8	1	0	4	2	0	1	0	9	2	32	3	0
Zimbabwe 1984	40	12	28	1	0	24	1	1	1	0	1	7	37	4	0
ASIA & PACIFIC															
Bangladesh 1975–76	8	3	5	0	1	3	0	1	0	0	1	1	11	1	2
Bangladesh 1979–80	13	4	9	2	1	4	0	2	0	0	2	0	18	4	2
Fiji 1974	42	6	36	15	0	9	5	6	0	0	2	3	48	27	0
Indonesia (Java & Bali) 1976	28	4	24	0	0	16	6	2	0	0	1	0	27	1	0
Indonesia (urban) 1983															
Jakarta	44	5	38	5	0	11	12	3	7	0	4	1	46	11	0
Medan	36	8	28	4	0	11	5	3	5	0	4	3	44	10	0
Semarang	54	6	49	6	0	14	11	5	13	0	4	1	54	13	1
Surabaya	47	7	39	7	0	15	7	6	4	0	5	1	47	13	0
Ujung Pandang	33	4	29	3	0	11	8	1	5	0	3	1	38	6	0
Korea, Rep. of 1974	37	9	29	2	3	9	9	6	0	0	5	3	47	2	6
Korea, Rep. of 1979	55	11	43	15	6	7	10	5	0	1	7	4	63	17	7
Malaysia (peninsular) 1974	35	10	26	3	0	18	1	3	0	0	4	2	36	6	1
Nepal 1976	3	0	3	0	2	0	0	0	0	0	0	0	4	0	3
Nepal 1981	7	0	7	2	3	1	0	0	0	0	0	0	10	3	5
Pakistan 1975	5	1	4	1	0	1	1	1	0	0	0	0	9	2	0
Philippines 1978	39	21	17	5	1	5	3	4	0	0	9	10	41	6	1
Sri Lanka 1975	34	13	21	10	1	2	5	3	0	0	8	2	38	13	1
Sri Lanka 1982	57	25	32	17	4	3	3	4	2	0	14	5	68	28	4
Thailand 1975	36	3	33	7	2	15	7	1	2	0	1	1	35	9	4
Thailand 1978	52	3	49	13	4	22	4	2	5	NA	1	2	55	17	5
Thailand 1981	59	3	56	19	4	20	4	2	7	0	1	2	63	25	8

Table 6 (continued). Contraceptive Use, by Method

Region, Country & Year	Any Method	Any Tradi-tional[1]	Any Modern[2]	Voluntary Sterilization		OCs	IUDs	Condoms	Injec-tables	Vaginal Methods	Rhythm	With-drawal	Age 35–44		
				Female	Male								Any Method	Sterilization Female	Male
LATIN AMERICA & CARIBBEAN															
Barbados 1980–81	47	2	45	13	0	17	4	5	3	3	1	1	52	26	0
Bolivia 1983	26	15	11	3	0	3	4	0	1	1	14	1	26	5	0
Brazil															
Amazonas (urban) 1982	53	3	50	33	0	16	0	1 .	0	1	2	1	65	55	0
Northeast region 1980	37	8	29	14	0	13	0	1	0	1	4	4	41	23	0
Piauí 1979	31	6	26	15	0	10	0	0	0	0	3	3	36	22	0
Piauí 1982	35	4	30	20	0	10	0	1	0	0	2	2	42	29	0
São Paulo 1978	66	14	51	15	0	28	0	7	0	1	5	7	69	24	1
Southern region 1981	66	14	52	15	0	33	1	3	0	1	5	9	66	24	0
Colombia 1976	45	12	33	4	0	14	9	2	1	3	5	5	44	7	0
Colombia 1978	48	9	39	7	0	19	8	1	1	2	4	4	52	15	1
Colombia 1980	51	8	43	11	0	19	8	1	2	2	5	2	53	21	0
Costa Rica 1976	67	11	56	12	1	25	6	9	2	2	5	5	64	20	1
Costa Rica 1978	66	9	57	13	1	25	5	9	2	1	5	3	69	27	1
Costa Rica 1981	66	9	57	16	1	22	6	9	2	1	6	3	73	37	1
Dominican Republic 1975	33	6	27	12	0	8	3	2	0	2	1	4	36	18	0
Dominican Republic 1983	47	4	43	27	0	9	4	1	0	0	1	3	55	43	0
Ecuador 1979	35	8	27	8	0	11	5	1	1	2	5	2	39	16	0
El Salvador 1978	34	2	32	18	0	9	3	2	0	0	2	0	36	22	0
Guatemala 1978	18	3	15	6	0	5	1	1	1	0	3	0	22	11	1
Guatemala 1983	25	4	21	10	1	5	3	1	0	1	3	1	30	18	1
Guyana 1975	35	3	32	9	0	10	8	3	0	2	1	1	39	20	0
Haiti 1977	19	14	6	0	0	4	0	1	0	0	5	5	20	0	0
Haiti 1983	7	3	4	1	0	2	0	1	0	0	2	2	9	2	0
Honduras 1981	27	3	24	8	0	12	3	0	0	1	1	2	31	13	1
Jamaica 1975–76	40	2	38	8	0	13	2	7	7	2	0	2	38	18	0
Jamaica 1983	52	3	49	10	0	21	2	8	8	1	1	2	59	33	0
Mexico 1976–77	32	7	25	3	0	12	6	1	2	1	3	4	32	5	1
Mexico 1978	42	7	35	7	0	15	7	1	3	2	3	3	39	12	0
Mexico 1979	40	6	34	9	0	14	7	1	3	1	4	2	39	14	0
Panama 1976	55	8	47	20	0	19	4	1	1	2	3	3	57	33	0
Panama 1979–80	61	5	57	29	0	19	4	2	1	1	3	1	72	54	1
Panama 1984	61	3	57	35	0	13	6	2	1	1	2	1	NA	NA	NA
Paraguay 1977	31	12	20	3	0	10	3	2	1	0	2	3	35	7	0
Paraguay 1979	39	13	25	2	0	13	6	2	2	1	4	2	40	4	0
Peru 1977–78	33	21	12	3	0	5	2	1	1	1	12	4	32	5	NA
Peru 1981	43	25	18	4	0	5	4	1	2	2	18	4	43	8	4
Trinidad & Tobago 1977	55	6	49	5	0	19	3	17	1	5	3	3	54	10	0
Venezuela 1977	49	12	38	8	0	15	9	5	0	1	4	5	52	18	0
MIDDLE EAST & NORTH AFRICA															
Egypt 1980	25	1	23	1	0	17	4	1	0	0	1	0	34	2	0
Egypt (rural) 1980	16	1	15	1	0	12	2	0	0	0	0	0	23	2	0
Jordan 1976	26	8	18	2	0	13	2	1	0	0	2	3	33	4	0
Jordan 1983	26	5	21	3	0	8	9	1	0	0	3	2	31	8	0
Morocco 1979–80	20	3	17	1	0	15	2	0	0	0	1	1	23	1	0
Morocco 1983–84	27	5	22	2	NA	18	2	1	NA	0	2	2	29	4	NA
Syria 1978	20	5	15	0	0	12	1	1	0	1	3	2	28	1	0
Tunisia 1978	32	7	25	7	0	7	9	1	0	1	4	2	40	14	0
Tunisia 1983	42	7	35	11	0	6	15	2	0	2	5	2	51	21	0
Yemen Arab Rep. 1979	1	0	1	0	0	1	0	0	0	0	0	0	2	1	0

0 = <0.5 NA = Not available

[1]Includes douche, withdrawal, rhythm, abstinence, and "other," except surveys conducted by the US Centers for Disease Control (US CDC), which include only withdrawal and rhythm. US CDC surveys treat douche, abstinence, and "other" as no method.

[2]Includes voluntary sterilization, oral contraceptives (OCs), intrauterine devices (IUDs), condoms, injectables, and vaginal methods (spermicides, diaphragms, and caps)

Independent National Surveys on Fertility and Family Planning

Together, India and China account for half of the population of the developing world. Neither country participated in WFS or CPS, but both have recently conducted surveys on fertility and family planning. In addition, five countries that did participate in WFS and/or CPS have since conducted similar surveys on their own. Results from these surveys are not included in Tables 3–16 because comparable data were not readily available.

In **India** the Ministry of Health and Family Welfare commissioned the Operations Research Group of Baroda, India, to conduct the Second All India Family Planning Survey in 1980–81. Nearly 35,000 married couples age 15–49 were interviewed. When asked to name all the family planning methods they knew of, 95 percent of women named female sterilization, 45 percent named condoms, 44 percent named the IUD, and 35 percent named OCs, all without prompting. Some 35 percent of couples were using contraception. About 22 percent were using male or female sterilization, 7 percent were using traditional methods, 4 percent were using condoms, and 2 percent were using other modern methods (568). The estimated TFR for 1976–81 was 4.7 (493).

In **China** the State Family Planning Commission conducted a national fertility survey in 1982. Women age 15–67 were interviewed. The households selected had a population of over one million—one in every thousand people in China. The estimated TFR for 1982 was 2.6–2.7, compared with an estimated TFR of 5.1 ten years earlier. Among married women age 15–49, 69 percent were using contraception in 1982. The most prevalent methods were the IUD, used by 35 percent of reproductive-age women, and female sterilization, used by 18 percent (504, 516). China is currently conducting fertility surveys similar to WFS. The International Statistical Institute Research Centre is providing technical assistance.

A major goal of both WFS and CPS was to develop the capability of participating countries to conduct their own fertility and family planning surveys afterwards. Five countries have done so using methods and questionnaires like those of a previous CPS or WFS—thus producing largely comparable results. These countries are Bangladesh, the Dominican Republic, Jamaica, Mexico, and Thailand.

In **Bangladesh**, Mitra and Associates, a private Bangladesh research firm under contract to the government, conducted a Contraceptive Prevalence Survey in 1983 patterned after earlier CPSs. The 1983 survey found that 99 percent of ever-married women under age 50 knew at least one method of family planning. Use of contraception had risen since the 1979 CPS; in 1983, 19 percent of currently married women under age 50 were using contraception compared with about 13 percent in 1979. The most widely used methods were voluntary female sterilization, used by about 6 percent of currently married women under age 50, and OCs, used by about 3 percent (594).

In the **Dominican Republic** in 1980 the National Council of Population and the Family (CONAPOFA) conducted a fertility survey patterned on the 1975 WFS—an unofficial second-round WFS survey. The 1980 survey was financed by UNFPA, and WFS staff provided limited technical assistance. Women age 15–49, regardless of marital status, were interviewed. Use of contraception had risen from 33 percent of currently married women age 15–44 in 1975 to 42 percent of married women age 15–49 in 1980. Voluntary female sterilization was the most prevalent method, used by 21 percent in 1980, compared with 12 percent in 1975. OCs were next at 5 percent in 1980. The 1980 TFR was about 4.7 (196), compared with 5.7 in 1975.

In **Jamaica** in 1979 the University of the West Indies conducted the Survey of Contraceptive Behavior on behalf of the National Family Planning Board, with support from US AID/Kingston. Women age 14–44, regardless of marital status, were interviewed. Some 98 percent of the women interviewed knew at least one method of family planning, and just over one-third were using some method of family planning. About 22 percent used OCs, 10 percent used injectables, 9 percent used female sterilization, and 6 percent used condoms (604, 625).

In **Mexico** in 1982 the government conducted the National Demographic Survey, similar to the 1976–77 WFS. Women age 20–44 were interviewed, regardless of marital status. At the time of the survey 41 percent were using some method of family planning. About 13 percent were using voluntary female sterilization and about 12 percent were using OCs (591, 629). The estimated TFR for Mexico was about 4.1, down from 5.1 in 1976–77.

In **Thailand** the 1984 Contraceptive Prevalence Survey was conducted by the National Institute of Development Administration at Mahidol University in collaboration with the Ministry of Public Health. The survey was financed by US AID/Bangkok. Although this survey was not conducted through the official Contraceptive Prevalence Survey program, it was designed to be comparable with CPS program surveys conducted in Thailand in 1978 and 1981. The 1984 CPS found that all currently married women age 15–49 knew at least one family planning method. Among currently married women age 15–44, use of contraception rose from 59 percent in 1981 to 65 percent in 1984. By 1984 female sterilization had become the most prevalent method, used by about 24 percent of married women age 15–44. OCs were next most prevalent, used by about 20 percent. Injectable contraceptives were used by about 8 percent. The 1984 TFR was about 3.5 (562, 563), compared with 3.7 in 1978 and 3.9 in 1981.

ilization to stop childbearing after two children, while in other countries, such as Guyana and Jamaica, sterilization is widely used only by women with five or more children (254). Such differences may reflect laws and the preferences of health care providers in different countries, as well as the preferences of couples.

Among women over age 35, a large percentage of contraceptors rely on voluntary sterilization—an average of 8 percent in African countries with national data but 43 percent in Asia, 42 percent in Latin America, and 25 percent in the Middle East (see Table 6). Most of these are female sterilizations. Voluntary sterilization is particularly important in Latin America, where in 10 of 18 countries at least 15 percent of couples age 35 or older rely on contraceptive sterilization. Puerto Rico is the area where voluntary sterilization is most prevalent. As first documented by Harriet Presser, the prevalence of voluntary sterilization among mothers age 20–49 was 34 percent in 1969. Some concern was expressed that this figure reflected a lack of choice among contraceptive methods, but a recent survey by the US CDC showed that in 1982 sterilization prevalence among ever-married women age 15–49 was even higher—39 percent—even though other family planning methods are widely available (585, 627).

Successive surveys show that in some developing countries the rate of voluntary female sterilization has recently increased sharply (585, 643). In 8 of 11 countries with two or more surveys presenting relevant data, the prevalence of female sterilization grew faster between surveys than the use of all other methods combined, although in some instances starting from a very low level (585). Surveys asking women for the date that they were sterilized also confirm that female sterilization rates have increased rapidly since the late 1960s and 1970s (537, 683). In contrast, surveys find little increase in male sterilization, and service statistics indicate that male sterilization rates may have declined since the mid-1970s (584).

Survey data suggest that there is substantial unmet demand for voluntary female sterilization. Where sterilization services are offered, sterilization prevalence rates are relatively high (498, 585). Further, many unsterilized women say that they are interested in voluntary sterilization. Surveys in Guatemala, Panama, and 10 Brazilian states found that 44 to 72 percent of women who were not subfecund or already sterilized and who wanted no more children expressed interest in voluntary sterilization (585, 597) (see **Population Reports**, *Minilaparotomy and Laparoscopy: Safe, Effective, and Widely Used*, C-9, May 1985).

Fertility Preferences and Use of Contraception

A report on 23 WFS surveys notes that in most countries the average woman wanted to have four children (567). Even in the countries with the largest average number desired—Kenya with seven, and Jordan and Sierra Leone with six—desired family sizes were smaller than the biological maximum a typical woman could have, estimated to be about 15 in the absence of breast-feeding (495). This suggests women's desire to limit family size to some extent in all of these countries.

Much clearer evidence of the desire to limit childbearing comes in answer to questions about whether women want more children now, want more later, or want no more at all. At the time of the survey, most women wanted to delay their next births or to end childbearing. Only in three countries—Ivory Coast, Nigeria, and Yemen Arab Republic—did the majority of women want another child immediately or within a year (see Table 7). In the African countries women who wanted to have children later outnumbered those who wanted to end childbearing completely. In contrast, in Asia and Latin America and the Caribbean, women who wanted to end childbearing predominated.

In Africa spacing children is an important reason for using family planning, while in Asia ending childbearing is the predominant reason. The percentage of African contraceptors who were spacing, rather than limiting, births ranged from 59 percent in Lesotho to 90 percent in Nigeria (see Table 7). Elsewhere women were less likely to be spacing births. The percent of all contraceptors who were spacing births averaged about 21 percent in Asian countries with national data, 36 percent in Latin American countries, and 30 percent in the Middle East. Except in Africa, better educated contraceptors were more likely to use contraception for spacing than less educated women. In many countries, however, there is no apparent difference between women with less than a primary education and women with no education. Also, there is no clear relationship between rural or urban residence and the likelihood that a contraceptor is spacing births.

The sex of children can be important to fertility preferences. Two studies of WFS data have found that in some countries—for instance, Bangladesh, Nepal, Pakistan, South Korea, Jordan, and Syria—women who lacked sons were more likely to say that they wanted more children. In other countries—for instance, Indonesia, the Philippines, and Sri Lanka—women with a preponderance of either sons or daughters were more likely to say that they wanted more children (259, 567, 665).

Women's desires for children of one sex or the other may not affect their actual behavior, however. In 21 of 28 WFS countries analyzed by John Cleland and colleagues, the sex composition of the family had no statistically significant effect on the likelihood of using contraception (259). In only seven did preferences for children of a particular sex significantly influence whether women used contraception. In South Korea, where preference for sons was most evident, about 60 percent of women with two sons were using contraception compared with 40 percent of women with one son and 30 percent of women with no sons, regardless of total family size. In Fiji, Malaysia, the Philippines, Sri Lanka, the Dominican Republic, and Mexico, women who had few or no children of one sex were slightly less likely to use contraception than women who had children whose sexes were more equally distributed. Desire for children of one sex or the other might have the most effect on the childbearing patterns of women with few children, since large families are likely to include at least one child of each sex (530, 684).

AVAILABILITY OF FAMILY PLANNING

Data on contraceptive availability come primarily from CPS surveys. These surveys show that in most countries government hospitals and health centers serve a large per-

Table 7. Desire for Future Births, Contraceptive Use by Desire for Future Births, and Contraceptive Use for Birth Spacing by Education Among Currently Married Women Age 15–44, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	Among Currently Married Women Age 15–44								% of Users Using Contraception for Birth Spacing[a]			
	Want More Now[b]		Want More Later		Want No More		Undecided or Not Stated			By Education		
	%	% Using[c]	%	% Using[c]	%	% Using[c]	%	% Using[c]	All Users	None	Less than Complete Primary	Complete Primary or More
AFRICA												
Benin 1981–82	24	32	50	29	6	25	20	17	85	86	90	73
Botswana 1984	24	12	44	34	30	35	2	20	63	62	52	69
Ghana 1979–80	31	8	48	14	10	19	11	6	81	73	*	86
Ivory Coast 1980–81	56	3	35	4	4	9	5	2	88	86	*	88
Kenya 1977–78	———		70**	6**	15	16	15	6	64	62	50	67
Lesotho 1977	———		85**	4**	14	16	1	*	59	*	*	60
Mauritania 1981	33	0	29	2	10	2	28	0	*	*	*	*
Nigeria 1981–82	60	5	25	7	4	11	11	6	90	89	95	87
Senegal (Sine-Saloum) (rural) 1982	23	1	71	0	7	2	0	*	*	*	*	*
Somalia (urban) 1983												
Baydhaba	30	1	67	0	2	*	1	*	*	*	*	*
Hargeisa	66	3	30	5	3	*	1	*	*	*	*	*
Kismayu	60	0	39	1	1	*	1	*	*	*	*	*
Mogadishu	29	1	66	1	4	*	1	*	*	*	*	*
Sudan (north) 1978–79	———		78**	4**	16	12	6	4	63	52	*	73
Zaire (urban) 1982–84												
Kananga	32	5	49	11	16	27	3	11	64	38	47	90
Kinshasa	29	19	47	47	17	38	7	27	82	67	79	84
Kisangani	32	7	35	22	26	26	7	28	64	41	73	65
Lubumbashi	25	16	42	40	23	54	11	34	66	62	61	69
Zimbabwe 1984	22	14	51	47	20	48	7	46	75	75	76	76
ASIA & PACIFIC												
Bangladesh 1975–76	———		32**	2**	59	13	9	2	10	10	6	9
Bangladesh 1979–80	26	3	21	10	45	22	7	4	16	11	14	34
Fiji 1974	16	11	31	46	48	61	6	40	35	15	20	43
Indonesia (Java & Bali) 1976	———		52**	22**	37	47	11	22	44	38	54	49
Indonesia (urban) 1983												
Jakarta	21	15	20	47	59	54	1	*	28	33	31	27
Medan	17	7	29	32	53	48	1	*	30	*	30	31
Semarang	16	20	21	54	62	65	1	*	28	27	29	27
Surabaya	20	12	19	45	61	59	1	*	23	31	28	22
Ujung Pandang	23	14	26	32	50	45	1	*	34	16	32	36
Korea, Rep. of 1974	———		28**	13**	71	51	1	12	10	2	5	12
Korea, Rep. of 1979	19	9	5	30	74	69	2	37	7	3	3	8
Malaysia (peninsular) 1974	10	0	46	35	43	48	1	22	45	25	34	56
Nepal 1976	———		62**	1**	29	8	9	1	14	8	*	*
Nepal 1981	39	2	11	1	36	16	15	2	14	14	*	14
Pakistan 1975	———		56**	1**	41	12	3	1	13	8	*	26
Philippines 1978	———		38**	29**	53	51	9	25	33	19	23	34
Sri Lanka 1975	———		36**	18**	59	49	6	24	21	5	12	26
Sri Lanka 1982	9	13	25	46	64	69	2	26	23	12	15	29
Thailand 1975	———		38**	25**	60	49	3	33	25	16	13	28
Thailand 1978	15	18	15	50	68	60	2	62	22	8	22	33
Thailand 1981	11	18	22	49	65	69	2	49	24	17	22	36
LATIN AMERICA & CARIBBEAN												
Barbados 1980–81	———		45**	38**	48	56	7	47	43	*	22	46
Bolivia 1983	11	26	14	34	73	24	2	21	31	18	25	34
Brazil												
Amazonas (urban) 1982	9	18	27	29	62	69	2	65	20	15	14	22
Northeast region 1980	10	14	32	24	57	48	1	60	26	22	21	31
Piauí 1979	9	14	21	22	69	36	2	43	21	14	17	28
Piauí 1982	11	16	31	15	56	48	2	61	22	18	16	28
São Paulo 1978	14	24	21	68	62	77	4	19	28	14	18	33
Southern region 1981	13	37	37	58	49	80	1	68	40	24	34	47
Colombia 1976	———		38**	41**	60	50	2	32	35	22	24	41
Colombia 1978	10	30	17	44	70	53	3	17	23	9	18	29
Colombia 1980	15	25	14	50	64	56	7	45	28	17	19	34

Table 7 (continued). Desire for Future Births and Contraceptive Use

Region, Country & Year	Among Currently Married Women Age 15–44								% of Users Using Contraception for Birth Spacing[a]			
	Want More Now[b]		Want More Later		Want No More		Undecided or Not Stated			By Education		
	%	% Using[c]	%	% Using[c]	%	% Using[c]	%	% Using[c]	All Users	None	Less than Complete Primary	Complete Primary or More
Costa Rica 1976	—	—	48**	65**	50	78	3	66	45	19	30	52
Costa Rica 1978	10	50	20	64	52	75	18	49	40	26	37	44
Costa Rica 1981	16	49	30	65	51	72	3	62	45	23	31	52
Dominican Rep. 1975	—	—	44**	21**	50	49	5	19	28	12	16	37
Dominican Rep. 1983	12	19	16	36	72	58	0	60	17	10	8	31
Ecuador 1979	8	21	30	37	55	44	7	23	35	16	22	39
El Salvador 1978	6	11	34	17	46	46	14	48	38	38	34	42
Guatemala 1978	21	4	32	12	45	29	2	12	28	15	21	38
Guatemala 1983	21	11	38	12	39	45	3	36	31	15	22	42
Guyana 1975	—	—	35**	25**	57	43	8	36	37	*	7	38
Haiti 1977	—	—	43**	17**	42	27	15	8	43	44	41	42
Haiti 1983	19	3	16	7	48	10	18	5	35	24	24	44
Honduras 1981	6	16	12	26	57	29	25	12	30	21	27	35
Jamaica 1975–76	—	—	43**	35**	48	49	9	37	43	*	*	43
Jamaica 1983	3	15	43	48	54	57	0	0	40	*	13	46
Mexico 1976–77	—	—	44**	29**	56	39	1	12	36	22	26	42
Mexico 1978	13	24	22	47	64	49	2	16	31	24	25	36
Panama 1976	—	—	38**	47**	61	65	2	41	30	18	22	32
Panama 1979–80	10	46	26	47	62	70	2	53	29	10	20	32
Paraguay 1979	15	23	51	54	29	45	5	32	68	34	53	73
Peru 1977–78	—	—	34**	32**	60	40	6	17	33	17	24	38
Peru 1981	8	22	18	49	73	45	1	17	25	8	14	31
Trinidad & Tobago 1977	—	—	41**	48**	52	64	7	61	52	10	*	53
Venezuela 1977	—	—	41**	43**	55	57	4	50	38	18	31	42
MIDDLE EAST & NORTH AFRICA												
Egypt 1980	25	2	21	25	52	41	2	7	19	14	14	25
Jordan 1976	—	—	56**	16**	40	45	4	30	36	23	21	43
Jordan 1983	14	12	44	19	42	38	0	100	39	22	31	47
Morocco 1979–80	—	—	49**	12**	39	43	12	14	29	23	*	45
Syria 1978	—	—	59**	11**	34	41	6	22	36	27	32	41
Tunisia 1978	—	—	42**	16**	45	48	13	46	26	16	30	44
Tunisia 1983	14	12	18	31	63	53	6	31	13	6	18	25
Yemen Arab Rep. 1979	68	1	7	3	18	4	8	1	42	*	*	*

Note: In WFS surveys only fecund married women are included. Other women were not asked about desire for more children.

0 = <0.5

*Fewer than 25 cases

**Women were asked whether they wanted another child at some time. The response did not specify whether now or later.

[a]Includes women using contraception who say that they want more children later but not now. Also includes women who say that they want another child now—that is, as soon as possible or within a year (see footnote b)—or are undecided but are using contraception.

[b]Those who say that they want another child as soon as possible or within a year

[c]Of those in preceding column, % who are using any contraceptive method including voluntary sterilization

centage of family planning users. Commercial outlets, private doctors, and other privately run clinics also are important service providers, especially in urban areas. The farther a woman lives from a source of family planning, the less likely she is to know where to go for family planning and the less likely she is to use family planning. Urban women are more likely than rural women to know of a source, and urban women usually live closer to a source.

In analyzing what effect the availability of family planning services has on family planning use, the question arises: what is cause and what is effect? Does a woman learn about family planning and look for a convenient source because she is already strongly motivated to practice family planning? Or does the existence of widespread information and convenient supplies and services motivate her to use family planning when in a different setting she might not do so? Clearly, more knowledge and greater availability of supplies and services make it easier for women to use family planning, but from survey data alone it is difficult to prove causality. Moreover, in addition to questions of personal motivation, programmatic factors can complicate analysis. For example, clinics may be located in a given area specifically because a high unmet need has been identified among the women living there.

Another limitation of some analysis is that it does not distinguish among different types of contraceptive methods. Knowledge of sources or the importance of distance to a source may vary depending on the method considered. Traditional methods do not generally require a source. Some women using clinical methods—IUDs or voluntary sterilization—may no longer know of a source even though they are current users. A woman whose husband has chosen vasectomy may not know where he obtained the procedure. When travel times are considered, women may prefer to make a single one-hour trip to a hospital for voluntary sterilization than to make frequent 15-minute trips to a pharmacy for a supply method such as OCs or condoms (506).

Richard Cornelius and John Novak have argued that any thorough analysis of the importance of availability to contraceptive use should consider: (1) the maturity of the family planning program, (2) the type of contraceptive—clinical methods (IUDs and voluntary sterilization) or supply methods (OCs, condoms, injectables, and spermicides), (3) rural/urban residence, and (4) women's preference for a certain method (517, 616). Another influence on women's choice of sources may be a desire for privacy, which may lead them to use sources farther from home. Also, obtaining family planning supplies can be combined in the same trip with other activities, such as visiting the market. These factors could make distance less important than it might be otherwise.

Source of Supply

In Africa, Asia, the Middle East, Latin America, and the Caribbean, most family planning users obtain supplies

Table 8. Sources of Contraception Among Currently Married Women Age 15–44 Who Are Currently Using a Modern Method of Contraception, Contraceptive Prevalence Surveys, 1977–1984

Region, Country & Year	% of Users Whose Source is:							
	Government		Private Clinical		Pharmacy[a]		Home/Community Delivery	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
AFRICA								
Botswana 1984	98	90	0	0	1	3	0	0
Zimbabwe 1984	49	82	7	7	0	4	42	5
ASIA & PACIFIC								
Bangladesh 1979–80	42	37	1	0	8	38	48	21
Indonesia (urban) 1983								
Jakarta		70		23		7		1
Medan		69		18		12		2
Semarang		75		14		6		6
Surabaya		74		11		14		1
Ujung Pandang		79		16		4		1
Korea, Rep. of 1979	54	37	35	40	8	21	3	2
Nepal 1981	75	85	0	0	3	8	15	3
Sri Lanka 1982	83	72	6	7	10	20	1	0
[Thailand 1978	76	63	6	8	12	24	6	5
[Thailand 1981	78	64	7	10	11	23	4	1
LATIN AMERICA & CARIBBEAN								
Barbados 1980–81	63[b]		11[b]		25[b]		0[b]	
Bolivia 1983	29	12	39	50	32	38	0	0
Brazil								
Amazonas (urban) 1982		24		44		30		0
Northeast region 1980	56	52	11	17	28	27	4	2
[Piauí 1979	60	74	4	6	26	19	7	0
[Piauí 1982	74	71	6	12	11	13	9	3
São Paulo 1978	20	19	12	16	65	62	0	0
Southern region 1981	14	22	19	17	63	59	0	0
[Colombia 1978	34	23	26[c]	38[c]	37	36	1	0
[Colombia 1980	56	26	10[c]	35[c]	32	38	1	0
[Costa Rica 1978	87[d]	61[d]	5	12	7	26	0	0
[Costa Rica 1981	84[d]	58[d]	3	9	12	33	0	0
Dominican Republic 1983	47	42	40	44	2	9	10	2
El Salvador 1978	91	82	3	8	5	10	0	0
[Guatemala 1978	67	63	15	17	15	16	2	0
[Guatemala 1983	68	68	15	14	11	13	4	3
Haiti 1983	64	53	9	13	0	14	14	14
Honduras 1981	56	42	12	17	15	27	13	11
Jamaica 1983	72	59	4	4	20	34	2	1
[Mexico 1978	57	50	16	14	23	33	0	0
[Mexico 1979	58	51	14	15	28	33	0	0
Panama 1979	89	65	5	17	4	14	0	0
Paraguay 1977	58	45	21	28	15	23	0	0
Peru 1981	37	32	17	24	46	43	0	0
MIDDLE EAST								
Jordan 1983	33	16	37	52	28	30	0	0
Tunisia 1983	84	70	3	10	10	19	0	0

Note: Data from urban surveys in Somalia and Zaire are not presented because of small number of cases in each cell.

Note: In this and other tables, brackets around country names indicate comparable data in two or more surveys from the same country.

0 = <0.5

[a]Includes shops

[b]Sample is combined rural/urban; no breakdown is available.

[c]Includes PROFAMILIA clinics

[d]Includes those who had government coupon for use in a pharmacy

and services from public sources—mainly government hospitals or health centers—rather than from private hospitals or clinics (including privately funded family planning programs), pharmacies, or doctors. Among rural women government sources were used most often in 19 of 23 countries with national data (see Table 8). Government sources served an average of 63 percent of rural users in these 23 countries. Urban women were somewhat less likely to use a government source. Government sources were used most often in 16 of the 23 countries and served an average of 52 percent of urban users in these 23 countries. Urban women were more likely than rural women to use pharmacies and private clinical services—private hospitals, clinics, and doctors. This pattern undoubtedly reflects the concentration of pharmacies and private physicians in urban areas.

Home or community-based delivery programs have been designed to bring contraceptives closer to potential users when clinics, pharmacies, and doctors are not nearby. At the time of the surveys, most countries did not have such programs. Only in Zimbabwe, Bangladesh, Nepal, the Dominican Republic, Haiti, and Honduras did home or community-based delivery reach 10 percent or more of rural users. In urban areas such programs are even less common. In 19 of 23 countries no more than 3 percent of urban contraceptors obtained family planning supplies through home or community-based delivery (see Table 8).

Knowledge of Family Planning Sources

Most women—but by no means all—say that they know where they could go for family planning advice or supplies (270) (see Table 9). In over three-quarters of the 18 countries where national CPS data on this subject are available, half or more of all currently married women knew a source for at least one modern method of contraception. Latin American women were more likely than Asian and Pacific women to know a source, but only in Nepal was the national figure strikingly low—15 percent. In Somalia national data are unavailable, but in four urban areas only one to 7 percent of women knew a source.

In all countries, however, there are some women who know about family planning but do not know where to go for information or supplies. A comparison of Tables 3 and 9 shows that, in Botswana, Bangladesh (1979–80), Indonesia (1983), Nepal (1981), Sri Lanka (1982), Barbados, the Dominican Republic (1983), Haiti (1983), Honduras, and Tunisia (1983), the percentage of women who knew of family planning exceeded the percentage who knew a source by at least 20 points.

Even though not all family planning methods require continuing supplies or services, women who know of a source for a modern method are more likely to use contraception than women who know no source (270, 320, 506, 620, 639). This holds true even after taking account of the effects of education, number of living children, age, urban or rural residence, desire for more children, and infant or child deaths (506, 620). In a study of WFS data from 15 countries, Elise Jones found that, on average, current use of contraception among women who knew a source for a modern method exceeded use among women who knew no source by 25 percentage points (270). Use of both modern and traditional methods was more widespread among women who knew a source (270, 639).

Most nonusers of contraception know a source for the method they would prefer to use (see Table 10). In 11 of 18 countries with national data, nonusers most often preferred OCs. Except in Haiti and Guatemala, over 75 percent of these women knew a source for OCs. In Sri Lanka and El Salvador nonusers most often preferred female sterilization, and in the Dominican Republic nearly as many women preferred female sterilization as preferred OCs. The vast majority of these women knew a source for voluntary sterilization services—98 percent in Sri Lanka, 81 percent in El Salvador, and 96 percent in the Dominican Republic. In Indonesia many women were interested in injectable contraceptives; among nonusers who preferred injectables, sources of injectables were better known there than in Latin American countries. Except in Africa, more urban than rural nonusers knew a source of contraception (see Table 9). The largest differences were in Honduras and Peru, where, for both clinical and supply methods, the percentage of urban nonusers who knew a source exceeded the percentage of rural nonusers who knew a source by over 30 points.

Proximity of Family Planning Sources

Rural women must travel longer than urban women to reach a source of family planning. This was true in nearly every country and for nearly every method (see Table 11). In South Korea, for instance, the median time reported to reach a source of OCs was 25 minutes for rural women and 9 minutes for urban women. The median time to reach a source of condoms was 21 minutes for rural women and 8 minutes for urban women.

For both rural and urban women, travel times to sources of clinical methods were generally longer than travel times to supply methods (see Table 11). This difference is not surprising; there are fewer clinics providing IUDs and voluntary sterilization than there are stores and clinics providing OCs and condoms. Sources for voluntary female sterilization usually took the longest to reach. This was true even when only sterilizations within five years before the survey—a measure of recent availability of sterilization services—were considered in 11 of the 37 surveys covered in Table 11 (data not shown). The data in Tables 10 and 11 are not ideal for determining whether travel time constrains women from choosing female sterilization, however. No distinction was made between postpartum and interval sterilizations. For women who deliver in a hospital, postpartum sterilization requires no additional travel time. In contrast, for women who desire an interval sterilization, travel time may be an important constraint (561).

Among the various supply methods, travel times to sources of OCs, condoms, injectables, and vaginal methods varied little within countries except in rural Sri Lanka and rural Thailand (see Table 11). In these areas travel times suggest that injectables were less available than the other supply methods. The median travel time of zero minutes to reach a source reported by users of OCs and condoms in rural Bangladesh means that at least half of rural OC and condom users received supplies through home delivery.

Availability and Contraceptive Use

Women are more likely to use contraception if it is close at hand than if it is not. The relationship observed between availability and contraceptive use, however, may depend

Table 9. Knowledge of a Source of Contraception Among All Currently Married Women Age 15–44 and Among All Those Who Are Not Using Contraception, Contraceptive Prevalence Surveys, 1978–1984

Region, Country & Year	% of Currently Married Women Who Know a Source For Any Modern Method			% of Currently Married Women Who Are Not Using Any Method			% of Currently Married Women Who Are Pregnant			Of Those Not Using Any Method: % Who Know a Source for a Supply Method[a]			% Who Know a Source for a Clinical Method[b]			And Who Know a Source, Median Perceived Minutes to Source for a: Supply Method[a]			Clinical Method[b]		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
AFRICA																					
Botswana 1984	57	58	55	71	74	62	12	13	10	†	†	†	†	†	†	†	†	†	†	†	†
Somalia (urban) 1983																					
Baydhaba			6			100			19			†			†			†			†
Hargeisa			7			97			19			†			†			†			†
Kismayu			1			100			20			†			†			†			†
Mogadishu			6			99			20			†			†			†			†
Zimbabwe 1984	46	48	42	60	64	53	13	14	12	†	†	†	†	†	†	†	†	†	†	†	†
ASIA & PACIFIC																					
Bangladesh 1979–80	46	44	62	87	88	78	14	15	13	8	6	29	40	39	51	0	0	2	[c]	[c]	33
Indonesia (urban) 1983																					
Jakarta			53			56			10			54			55			30			30
Medan			50			64			14			53			52			30			30
Semarang			55			46			8			57			57			31			32
Surabaya			46			53			9			48			48			30			30
Ujung Pandang			40			67			14			41			38			15			15
Korea, Rep. of 1979	97	97	97	45	46	45	8	7	9	91	91	91	90	92	88	10	25	8	23	35	20
Nepal 1981	15	13	44	93	94	77	11	11	9	12	11	37	4	3	18	60	60	15	120	120	15
Sri Lanka 1982	77	76	80	43	43	41	11	12	9	86	84	90	97	97	97	30	30	15	32	46	28
Thailand 1978	97	97	96	48	50	40	10	10	10	93	93	92	89	88	92	15	17	11	45	50	37
Thailand 1981	89	88	96	41	42	35	9	8	11	95	95	99	94	94	97	15	15	10	20	25	15
LATIN AMERICA & CARIBBEAN																					
Barbados 1980–81[d]	70			53			5			81			45			30			31		
Bolivia 1983	38	22	58	74	87	57	15	18	12	21	14	38	14	8	28	20	30	15	30	38	25
Colombia 1978	88	78	93	52	69	42	15	17	14	73	64	82	63	54	72	17	63	11	33	66	21
Colombia 1980	89	79	93	49	61	44	12	13	12	80	70	86	67	55	75	15	60	10	30	60	20
Costa Rica 1978	89	86	92	34	38	31	12	13	12	84	79	90	63	55	71	19	26	13	22	29	17
Costa Rica 1981	99	99	100	34	37	31	11	10	11	96	95	98	96	94	98	†	†	†	†	†	†
Dominican Rep. 1983	69	69	70	53	58	49	14	15	13	91	89	93	91	87	94	30	60	20	30	45	15
Haiti 1983	55	50	74	93	95	87	16	17	15	51	46	71	27	22	44	30	60	15	30	61	20
Honduras 1981	67	61	79	73	83	53	17	19	14	59	51	83	53	45	76	30	60	15	75	120	30
Jamaica 1983	94	94	94	48	49	47	9	10	9	87	88	87	77	76	78	†	†	†	†	†	†
Mexico 1978	78	64	85	58	74	49	14	17	13	63	54	70	49	33	61	17	28	13	23	51	20
Mexico 1979	78	66	92	60	71	48	13	15	11	61	50	78	49	36	70	9	21	8	23	34	22
Peru 1981	65	40	77	57	77	47	14	19	12	49	28	65	44	24	59	14	59	11	27	86	25
MIDDLE EAST & NORTH AFRICA																					
Tunisia 1983	78	72	84	58	71	45	15	18	12	80	75	89	79	74	86	30	59	15	44	60	30

Note: Data from urban survey in Zaire are not presented because of small number of cases in each cell.

†Question not asked

[a]Includes oral contraceptives, condoms, injectables, and vaginal methods (spermicides, diaphragm, and cap)

[b]Includes IUD and female and male voluntary sterilization

[c]Median time longer than one hour; no further information available.

[d]Sample is combined rural/urban; no breakdown is available.

Table 10. Preference for Method of Contraception, Knowledge of Source for That Method, and Median Perceived Travel Time in Minutes to That Source Among Currently Married Women Age 15–44 Who Are Not Currently Using Contraception but Who Want to Use Contraception or Who Express a Preference, Contraceptive Prevalence Surveys, 1978–1984

Region, Country & Year	Voluntary Female Sterilization			Oral Contraceptives			IUD			Condoms			Vaginal Methods			Injectables			Rhythm	Any Method	Don't Know
	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Preferring	% Preferring
AFRICA																					
Botswana 1984	1	†	†	49	†	†	2	†	†	18	†	†	18	†	†	3	†	†	0	0	9
Somalia (urban) 1983																					
Baydhaba	0	†	†	68	†	†	4	†	†	20	†	†	0	†	†	0	†	†	1	0	0
Hargeisa	0	†	†	86	†	†	0	†	†	11	†	†	0	†	†	0	†	†	0	0	0
Zaire (urban) 1982–84																					
Kananga	11	†	†	17	†	†	3	†	†	1	†	†	2	†	†	9	†	†	12	0	2
Kinshasa	6	†	†	24	†	†	8	†	†	2	†	†	2	†	†	18	†	†	16	0	11
Kisangani	24	†	†	19	†	†	2	†	†	4	†	†	0	†	†	10	†	†	19	0	7
Lubumbashi	11	†	†	21	†	†	1	†	†	2	†	†	3	†	†	13	†	†	15	0	9
Zimbabwe 1984	2	†	†	61	†	†	3	†	†	2	†	†	0	†	†	17	†	†	0	0	10
ASIA & PACIFIC																					
Indonesia (urban) 1983																					
Jakarta	4	78	*	41	93	30	16	97	29	3	*	*	0	*	*	33	94	30	3	1	0
Medan	7	80	31	36	92	30	10	87	28	4	76	*	0	*	*	36	89	30	5	3	0
Semarang	4	*	*	31	91	59	11	98	30	4	*	*	0	*	*	47	93	58	2	0	0
Surabaya	9	96	29	43	90	29	11	89	29	9	84	17	0	*	*	21	87	31	5	2	0
Ujung Pandang	2	*	*	46	91	16	15	89	16	1	*	*	0	*	*	33	87	16	3	1	0
Sri Lanka 1982	50	98	61	15	87	30	4	97	44	3	93	20	0	*	*	16	88	32	10	2	0
Thailand 1978	31	92	56	37	93	17	3	*	*	3	*	*	0	*	*	18	†	†	1	2	0
Thailand 1981	25	97	30	35	98	15	5	95	30	3	91	10	0	*	*	27	93	30	2	2	0
LATIN AMERICA & CARIBBEAN																					
Barbados 1980–81	2	*	*	49	91	28	5	*	*	4	*	*	7	88	*	6	*	*	2	1	24
Bolivia 1983	4	60	*	16	70	20	16	62	21	1	*	*	1	*	*	5	60	*	20	37	0
Brazil																					
Amazonas (urban) 1982	22	31	*	37	68	10	1	*	*	2	*	*	8	*	*	0	†	†	11	—19—	
Northeast region 1980	26	40	50	28	70	20	1	*	*	1	*	*	0	†	†	0	†	†	7	—37—	
Piauí 1979	25	77	60	46	66	40	1	*	*	1	*	*	0	†	†	0	†	†	6	—21—	
Piauí 1982	15	52	40	38	66	60	2	*	*	6	*	*	7	*	*	0	†	†	5	—27—	
Southern region 1981	8	*	*	43	77	30	5	*	*	3	*	*	1	*	*	0	†	†	4	—35—	
Colombia 1978	20	80	34	24	86	17	5	83	31	1	90	20	2	94	12	11	69	24	5	1	31
Colombia 1980	17	87	30	27	95	15	8	95	30	1	*	*	4	95	15	9	82	15	4	1	31
Costa Rica 1981	8	†	†	37	†	†	10	†	†	6	†	†	1	†	†	9	†	†	7	0	22
Dominican Rep. 1983	34	96	30	36	97	30	10	93	30	2	*	*	1	*	*	12	86	30	4	1	0
El Salvador 1978	40	81	75	29	97	30	3	*	*	4	*	*	0	†	†	0	†	†	0	—25—	
Guatemala 1978	10	60	60	33	44	60	2	*	*	0	*	*	0	†	†	17	55	20	0	—38—	
Guatemala 1983	18	75	60	27	53	20	4	*	*	0	†	†	0	†	†	14	66	20	0	—37—	
Haiti 1983	5	51	25	30	56	30	2	68	31	1	58	*	1	37	*	14	47	48	2	0	44

Table 10 (continued). Preference for Method of Contraception Among Nonusers

Region, Country & Year	Voluntary Female Sterilization			Oral Contraceptives			IUD			Condoms			Vaginal Methods			Injectables			Rhythm	Any Method	Don't Know
	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Knowing Source**	Median Min. to Source	% Preferring	% Preferring	% Preferring
LATIN AMERICA & CARIBBEAN (continued)																					
Honduras 1981	28	86	91	39	78	30	4	93	20	0	*	*	1	*	*	14	51	60	3	1	10
Jamaica 1983	13	91	†	44	98	†	3	*	†	7	93	†	3	*	†	16	97	†	1	0	13
Panama 1979–80	32	85	30	37	82	15	10	86	20	1	*	*	0	†	†	7	*	*	0	—13—	
Peru 1981	10	89	25	22	90	14	19	95	20	1	*	*	3	*	*	12	96	20	25	8	0
MIDDLE EAST																					
Jordan 1983	8	*	*	32	97	30	37	84	30	1	*	*	0	†	†	0	†	†	11	—11—	
Tunisia 1983	18	87	59	17	86	28	24	91	31	0	*	*	2	*	*	7	65	43	4	0	27

Note: Data for Kismayu and Mogadishu, Somalia, are not presented because of small number of cases in each cell.
Note: In this and other tables, brackets around country names indicate comparable data in two or more surveys from the same country.
0 = <0.5

* Fewer than 25 cases
**Of those preferring this method, as indicated in preceding column
†Question not asked

on how availability is defined. Some studies define availability as the time it takes to travel to the nearest family planning outlet, while other studies define availability as the distance to an outlet. Some studies use objective measures of distance or travel time to outlets, while others use women's reports of distance or travel time. Some studies measure availability to individuals—for instance, how far a woman lives from a family planning outlet—while other studies measure availability in a community—for instance, total number of outlets in a woman's community. Finally, some studies measure availability of a family planning outlet regardless of methods offered, while other studies measure availability of a source for each specific method of family planning (544).

Use of contraception is clearly related to distance from a source. Three studies involving WFS data from Mexico, South Korea, Bangladesh, Thailand, and the Philippines defined availability as the distance a woman lived from a family planning source. Distances were measured objectively or based on reports of community officials. These studies found that the closer a woman lived to a source, the more likely she was to use contraception. Distance was important even after taking into account various combinations of other characteristics known to affect use of contraception—for instance, education, age, number of living children, and level of community development (328, 525, 660).

Some studies that define availability as the time it would take a woman to reach a family planning source have produced similar results. CPS data from Colombia, Costa Rica, Honduras, Malaysia, Nepal, South Korea, and Thailand show that, among women who knew of a source, those who reported longer travel times to the nearest source were less likely to use contraception than women who reported shorter travel time (517, 638). This was true for both rural and urban women. Women who lived over one hour from a source were markedly less likely to use contraception than women whose travel was shorter. Contraceptive use among women in rural areas was particularly affected by travel time (517).

Distance and travel time to a source are important not only because of convenience, but also because women who live far from the nearest source are less likely to know that it exists at all. Two studies of seven WFS countries found that knowing a family planning source was an important determinant of use. Among women who knew of a source, however, the time to reach that source was not important to contraceptive use (506, 620). In another study women in Mexico and South Korea reported the time to reach the nearest family planning source. Women who thought a source was nearby, regardless of actual availability, were more likely to use contraception than women who did not think a source was nearby or who knew of no source (658).

FERTILITY LEVELS AND TRENDS

In the countries surveyed by WFS and CPS, total fertility rates (TFRs) averaged nearly five in Asia and Latin America, over five in the Middle East, and nearly seven in Africa.

Table 11. Median Perceived Travel Time to Source for Specific Methods of Contraception Among Currently Married Women Age 15–44 Who Are Currently Using A Modern Method of Contraception, Contraceptive Prevalence Surveys, 1978–1984

Region, Country & Year	Median Minutes to Source for Users of:											
	Female Sterilization		OCs		IUDs		Condoms		Injectables		Vaginal Methods	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
AFRICA												
Botswana 1984	*	*	22	15	30	15	*	*	*	*	*	*
Zimbabwe 1984	*	*	10	15	*	*	*	*	*	*	*	*
ASIA & PACIFIC												
Bangladesh 1979–80	100	30	0	10	*	*	0	8	*	*	*	*
Indonesia (urban) 1983												
Jakarta		32		15		30		15		15		*
Medan		30		15		28		15		16		*
Semarang		29		10		30		15		28		*
Surabaya		29		10		17		10		15		*
Ujung Pandang		20		15		15		*		15		*
Korea, Rep. of 1979	38	21	25	9	35	22	21	8	*	*	*	*
Nepal 1981	122	15	60	*	*	*	*	*	*	*	*	*
Sri Lanka 1982	90	30	30	15	59	*	19	15	62	*	*	*
Thailand 1978	60	39	14	12	64	*	29	*	40	*	*	*
Thailand 1981	59	21	15	10	45	20	15	10	30	11	*	*
LATIN AMERICA & CARIBBEAN												
Barbados 1980–81	30**		30**		30**		29**		30**		16**	
Bolivia 1983	60	25	35	15	60	20	*	*	*	*	*	*
Brazil												
Amazonas (urban) 1982		15		15		*		*		*		*
Northeast region 1980	60	25	30	10	*	*	*	10	*	*	*	15
Piauí 1979	120	15	40	10	*	*	*	*	*	*	*	*
Piauí 1982	90	20	90	10	*	*	*	*	*	*	*	*
São Paulo 1978	30	30	30	10	*	*	*	5	*	*	*	*
Southern region 1981	30	15	30	15	*	20	*	10	*	*	*	*
Colombia 1978	144	61	61	12	68	30	*	*	*	*	*	11
Colombia 1980	62	30	31	10	60	26	*	*	*	*	*	10
Costa Rica 1978	85	25	26	13	32	19	25	12	*	*	*	*
Costa Rica 1981	†	†	30	15	31	21	30	15	31	*	*	*
Dominican Republic 1983	60	30	30	15	*	20	*	*	*	*	*	*
El Salvador 1978	60	30	30	15	*	20	*	*	*	*	*	*
Guatemala 1978	60	30	18	15	*	40	*	*	*	*	*	*
Guatemala 1983	45	30	15	20	25	30	*	*	*	*	*	*
Haiti 1983	*	*	15	*	*	*	*	*	*	*	*	*
Honduras 1981	120	20	29	15	*	30	*	*	*	*	*	*
Jamaica 1983	60	31	30	15	*	*	19	15	*	15	*	*
Mexico 1978	51	16	16	5	*	16	*	*	*	6	*	4
Panama 1979	30	25	30	15	*	15	*	*	*	*	*	*
Peru 1981	*	30	*	*	*	30	*	*	*	15	*	10
MIDDLE EAST & NORTH AFRICA												
Jordan 1983	60	30	30	15	*	30	*	*	*	*	*	*
Tunisia 1983	77	32	31	14	61	29	*	11	*	*	*	*

Note: Data from urban surveys in Somalia and Zaire are not presented because of small number of cases in each cell.

0 = <0.5

*Fewer than 25 cases

**Sample is combined rural/urban; no breakdown is available.

†Question not asked

These rates represent the average number of children a woman would have if she were to pass through her reproductive years bearing children at the same rates as the women now in each age group. Fertility has begun to decline in many countries in Latin America and Asia, while in Africa fertility levels remain high. In most countries fertility levels are higher among certain groups of women—women with low levels of education and rural women. Marital patterns also affect fertility. Women who marry young have the highest fertility. Women's characteristics, such as education, rural/urban residence, and age at marriage, are often interrelated, making it difficult to analyze their separate effects.

Surveys—and particularly the WFS and CPS—are a major source of data on fertility levels and trends in developing countries since vital statistics and census data are often poor or nonexistent and lack detailed information about the determinants of fertility. Because of methodological problems, however, survey estimates of fertility levels and trends should be interpreted cautiously. Unlike censuses, surveys are subject to sampling errors—the chance dis-

crepancy between a figure for the surveyed sample and the comparable figure for the entire population. Like censuses, surveys also are subject to nonsampling errors, including inaccurate responses, interviewers' errors, and incorrect data processing.

WFS estimates of fertility rates are considered more accurate than CPS estimates because WFS estimates are based on more information and generally larger sample sizes. The WFS asked women about the dates of all previous births. Most CPSs asked women about their last birth only. Thus CPS estimates are calculated on the basis of fewer years. Also, data checks and adjustments that can be performed with WFS data are not possible with CPS data (478, 604).

Fertility Levels

TFRs exceeded 4.0 in 80 percent of the countries with available data and ranged from 2.4 in Barbados in 1980–81 to 8.5 in Yemen Arab Republic in 1979 (see Table 12). TFRs were highest in Africa and the Middle East. In sub-Saharan Africa TFRs ranged from nearly 5.8 in Lesotho in 1977 to over 8.3 in Kenya in 1977–78. In North Africa and the Middle East, Egypt had the lowest TFR, at 5.3, and Yemen Arab Republic, the highest. In the four other countries surveyed in the region—Jordan, Morocco, Syria, and Tunisia—TFRs were between 5.9 and 7.5. (TFRs cited here are only those with denominators of all women of reproductive age.)

Total fertility rates were lower in Asia and in Latin America and the Caribbean, averaging less than 5. In Latin America and the Caribbean, TFRs ranged from 2.4 in Barbados to 6.5 in Honduras. For 5 of 8 Asian and Pacific countries with national data, TFRs ranged from 2.6 in South Korea (979) to 5.2 in the Philippines (1978). Fertility rates were higher in Bangladesh (1975–76) (6.1), Nepal (1976) (6.2), and Pakistan (6.3).

If the fertility rates as calculated from the most recent surveys were to continue, substantial population growth would occur. Replacement level fertility—the level of fertility that would have to be sustained in the long term so that the number of births in a year would eventually equal the number of deaths—is about 2.2 to 2.5 births per woman in developing countries (126). Thus, in every country except Barbados and South Korea, fertility was well above replacement level at the time of the most recent survey.

Fertility Trends

Fertility declines are underway in many developing countries. The easiest way to examine fertility trends is to compare total fertility rates from successive surveys. Fertility appears to have declined in 8 of the 17 countries where TFR data from more than one national survey are available (see Table 12 and Figure 1, p. M-291). In South Korea, Thailand, Colombia, the Dominican Republic, Jamaica, Mexico, Paraguay, and Jordan, TFRs dropped 0.7 to 1.8 points between surveys two to eight years apart. Little or no fertility decline was evident between surveys in Bangladesh, Nepal, Guatemala, Haiti, Peru, or Tunisia. In these countries TFRs remained high—above 5. Also, no fertility decline was evident between surveys in Sri Lanka, Thailand, Costa Rica, or Panama, where TFRs were lower.

Further evidence of fertility declines in Asia and Latin America comes from comparing the TFR to the number of children ever born to women who were 40–44 at the time of the survey. This allows a look at the trend in a country with a single survey (see Table 12). TFR represents current fertility levels, while the number of children ever born to women age 40–44 represents fertility levels that prevailed in the past. Comparing number of children ever-born with the TFR for each country not only corroborates evidence of fertility declines from successive surveys, but also suggests fertility declines in many other countries. In nearly every country in Asia and Latin America, the TFR is smaller than the number of children ever born. TFRs also are smaller in North Africa and the Middle East, although the differences are not as great. Comparing the number of children born to older women with TFR also reveals fertility declines that preceded the first survey in two countries where two or more surveys were taken—Sri Lanka and Costa Rica.

In contrast to other areas, fertility levels in Africa appear to be rising. Comparisons of TFR and number of children born suggest that fertility has increased substantially in Benin, Cameroon, and Nigeria, and to a lesser extent in Ghana, Ivory Coast, Kenya, Lesotho, Mauritania, and Senegal (see Table 12). Possible reasons for rising fertility in Africa are declines in sterility, in breast-feeding, and in postpartum abstinence, while use of contraception remains slight (575). Especially among younger women, declines in the duration of breast-feeding and in polygamy have produced higher age-specific fertility in recent years (209). It is also possible, however, that reporting errors explain part or all of this apparent increase. Because older women often underreport births, especially if the child died or is living away from home, fertility may be stable or declining despite the appearance of an increase. Also, women age 38 or 39 who misreport that they are 40—and thus are counted in the 40–44 age group—may lower the average number of children ever born to women 40–44 if, being younger, they have fewer children.

Fertility and Age, Education, Residence, and Employment

Age. As couples increasingly control their fertility and as fertility levels decline, childbearing is more and more concentrated in a narrow age range, usually 20–29. A summary of WFS findings indicates that fertility was relatively high only between ages 20–29 in Colombia, Fiji, South Korea, Malaysia, Paraguay, Thailand, and Turkey. Fertility was relatively high over an even narrower span—ages 20–24—in the Dominican Republic, Guyana, Jamaica, and Panama. In all these countries fertility had declined substantially. In contrast, in high-fertility countries such as Nepal, Pakistan, and most African and Middle Eastern countries, the highest fertility rates spanned a wider age range, usually ages 20–34 (140, 249).

Education. In general, women with less education have more children than women with more education. The difference is largest where fertility has declined substantially. The differences in total fertility rates between the least and most educated women are greatest in Latin America, in many countries amounting to about 4 to 5 children. The difference is smaller in Africa, the Caribbean, and Asia—usually about one to two children (140, 249). Like many previous studies, a WFS cross-national study found that women with higher levels of education

have fewer children because (1) they are more likely to use contraception and (2) they marry later than women with lower levels of education (255). An analysis of WFS data from 29 countries found that education reduced fertility more by increasing contraceptive use within marriage than by influencing women to postpone marriage, whereas urban residence reduced fertility more by delaying marriage (649).

In contrast, in a number of Asian and African countries, women with moderate amounts of education had higher fertility rates than women with either less or more education (249). This may occur because women with moderate levels of education breast-feed less than the least educated women but do not use contraception as much as the best educated women (255).

Rural/urban residence. Fertility levels are higher in rural areas than in urban areas. In general, rural/urban differences are greatest in Latin America (see Table 12). The difference was largest in El Salvador in 1978, where the urban TFR was 3.3 and the rural TFR was 8.4. Similarly, in Honduras in 1981 the urban TFR was 4.1 and the rural TFR was 8.2. Total fertility rates are higher among rural women for two reasons: (1) they are married longer and (2) fertility during marriage is higher (249).

Table 12. Average Number of Children Ever Born (CEB) to Women Age 40–44 and Current Total Fertility Rate (TFR), Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	Total		Urban		Rural	
	CEB to Women Age 40–44	TFR	CEB to Women Age 40–44	TFR	CEB to Women Age 40–44	TFR
AFRICA						
Benin 1981–82	6.1	7.1	6.0	NA	6.1	NA
Botswana 1984	6.3	6.5	5.8	NA	6.4	NA
Cameroon 1978	5.2	6.4	4.5	NA	5.3	NA
Ghana 1979–80	6.1	6.5	5.7	NA	6.3	NA
Ivory Coast 1980–81	6.7	7.4	6.6	NA	6.8	NA
Kenya 1977–78	7.6	8.3	7.4	NA	7.6	NA
Lesotho 1977	5.1	5.8	4.7	NA	5.2	NA
Mauritania 1981	6.0	6.3	5.7	NA	6.2	NA
Nigeria 1981–82	5.1	6.3	4.6	NA	5.3	NA
Senegal 1978	6.8	7.2	6.5	NA	6.8	NA
Senegal (Sine-Saloum) (rural) 1982					7.1	6.4
Sudan (north) 1978–79	6.0	6.0	6.1	NA	6.0	NA
Zimbabwe 1984	7.0	6.5	5.3	NA	7.8	NA
ASIA & PACIFIC						
Bangladesh 1975–76	7.1	6.1	6.7	NA	7.1	NA
Bangladesh 1979–80[a]	6.5	6.2	6.3	6.1	6.5	6.2
Fiji 1974	6.2	4.2	5.5	NA	6.6	NA
Indonesia (Java & Bali) 1976	5.3	4.7	5.6	NA	5.3	NA
Indonesia (urban) 1983						
Jakarta[b]			5.9	6.4		
Medan[b]			6.6	7.5		
Semarang[b]			4.6	5.0		
Surabaya[b]			5.0	6.4		
Ujung Pandang[b]			6.7	7.7		
Korea, Rep. of 1974	5.1	4.3	4.5	NA	5.9	NA
Korea, Rep. of 1979	4.5[c]	2.6	3.9[c]	2.4	5.1[c]	3.1
Malaysia (peninsular) 1974	6.1	4.7	5.6	NA	6.4	NA
Nepal 1976	5.6	6.2	4.7	NA	5.6	NA
Nepal 1981[b]	5.5	5.9	NA	NA	NA	NA
Pakistan 1975	7.0	6.3	6.9	NA	7.0	NA
Philippines 1978	6.7	5.2	5.9	NA	7.1	NA
Sri Lanka 1975	5.5	3.8	4.9	NA	5.6	NA
Sri Lanka 1982	4.7[a]	3.7	NA	NA	NA	NA
Thailand 1975	6.1	4.6	5.0	NA	6.3	NA
Thailand 1978	5.9	3.7	NA	NA	NA	NA
Thailand 1981	5.3[a]	3.9	NA	NA	NA	NA
LATIN AMERICA & CARIBBEAN						
Barbados 1980–81[c]	4.3	2.4				
Bolivia 1983[a]	6.4	8.6	5.5	NA	7.1	NA
Brazil						
Amazonas (urban) 1982			4.9	3.6		
Northeast region 1980	7.1	5.4	6.3	4.6	8.3	6.8
Piauí 1979	6.7	5.9	7.3	3.5	7.7	6.8
Piauí 1982	6.6	5.1	5.3	3.7	6.9	5.3
São Paulo 1978	4.0	2.8	3.7	2.6	5.5	4.2
Southern region 1981	4.6	3.6	4.1	3.3	5.8	5.3
Colombia 1976	6.1	4.7	5.5	NA	7.2	NA
Colombia 1978	6.0	3.8	5.2	3.1	7.4	5.4
Colombia 1980	5.5	3.6	4.9	3.0	7.3	5.1
Costa Rica 1976	6.1	3.3	4.6	NA	7.7	NA
Costa Rica 1978	5.5	4.1	NA	NA	NA	NA
Costa Rica 1981	5.3	3.6	NA	NA	NA	NA
Dominican Rep. 1975	6.4	5.7	5.1	NA	8.0	NA
Dominican Rep. 1983	6.2	4.1	5.3	3.6	7.0	4.9
Ecuador 1979	6.4	5.3	5.4	NA	7.2	NA
El Salvador 1978	6.1	6.3	4.7	3.3	7.0	8.4
Guatemala 1978	6.5	6.1	5.8	4.1	6.6	6.6
Guatemala 1983	6.3	5.8	4.7	4.2	6.8	6.3
Guyana 1975	6.3	5.0	5.0	NA	6.9	NA
Haiti 1977	5.6	5.5	4.6	NA	6.0	NA
Haiti 1983	5.6	5.9	4.2	NA	5.9	NA
Honduras 1981	7.0	6.5	5.4	4.1	7.9	8.2
Jamaica 1975–76	5.4	5.0	4.4	NA	6.0	NA
Jamaica 1983	5.4	3.5	5.3	NA	5.6	NA
Mexico 1976–77	6.6	6.2	6.0	NA	7.6	NA
Mexico 1978	6.4	5.2	NA	NA	NA	NA
Mexico 1979	6.4	4.6	NA	NA	NA	NA
Panama 1976	5.6	3.8	4.6	NA	7.2	NA
Panama 1979–80	5.8	3.9	4.8	2.7	6.4	5.2
Paraguay 1977	7.0	6.8	3.2	2.7	7.8	8.5
Paraguay 1979	5.8	5.0	4.3	NA	7.1	NA
Peru 1977–78	6.6	5.6	6.1	NA	7.4	NA
Peru 1981	6.1	5.2	NA	NA	NA	NA
Trinidad & Tobago 1977	5.2	3.3	4.8	NA	5.8	NA
Venezuela 1977	6.1	4.5	5.8	NA	7.8	NA
MIDDLE EAST & NORTH AFRICA						
Egypt 1980	6.5	5.3	5.8	NA	7.0	NA
Jordan 1976	8.6	7.5	8.5	NA	8.7	NA
Jordan 1983	7.5	6.6	7.2	6.1	7.4	7.9
Morocco 1979–80	7.1	5.9	6.1	NA	7.8	NA
Syria 1978	7.5	7.5	7.2	NA	7.8	NA
Tunisia 1978	6.6	5.9	6.4	NA	6.8	NA
Tunisia 1983[a]	6.5	7.0	6.0	NA	7.0	NA
Yemen Arab Rep. 1979	6.6	8.5	5.8	NA	6.7	NA

NA = Not available

†Question not asked

[a]Based on ever-married women; higher than TFR based on all women.

[b]Based on women in union; higher than TFR based on all women.

[c]Sample is combined rural/urban; no breakdown is available.

Economic and cultural reasons often cited for higher fertility in rural areas include lower costs of having and raising children, the children's greater contribution to the family income, and the strength of traditional pronatalist values in rural areas (690).

Another important explanation, however, is that rural women have less education and fewer opportunities for paid employment. Germán Rodríguez and John Cleland found that half of the apparent effect of residence was accounted for by rural/urban differences in education and employment of wives and husbands (640). Also, contraceptives are less available in rural areas (see p. M-313).

Employment. The relationship between women's employment and fertility is complex. Some women may have fewer children so that they can work. Other women may find it easier to work because they have few children—perhaps because they are less fertile than other women. Still others may work because they have many children to support. Since no one explanation fits all women, the relationship between employment and fertility is difficult to interpret (140, 612, 667).

A study of WFS data from 38 countries, conducted by the Population Division of the United Nations, found that women currently working in professional or clerical jobs had lower fertility rates than women working in domestic service, in agriculture, or not working. The difference was not great, however. If other socioeconomic factors were taken into account, professional and clerical workers would average one-half a child fewer after 20 years of marriage than women who did not work. The difference in fertility between professional and clerical workers, on one hand, and agricultural workers and non-working women, on the other, was greatest in the most developed of the 38 countries. In the least developed countries, type of work had no consistent effect on fertility. Also, the differences in fertility among types of workers were greatest where family planning programs are strong and where women's status is relatively high, as measured by educational attainment and age at marriage (668).

Marriage Patterns and Fertility

Women who marry later have fewer children. Robert Lightbourne and colleagues analyzed WFS data from 29 coun-

Table 13. Singulate Mean Age at Marriage, and Percentages Married Before Age 20 Among All Women Age 20–24 and Age 40–44, by Place of Residence, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	Singulate Mean Age at Marriage[a]	% Married Before Age 20					
		Total		Rural		Urban	
		Women 20–24	Women 40–44	Women 20–24	Women 40–44	Women 20–24	Women 40–44
AFRICA							
Benin 1981–82	18.2	74	64	78	68	64	49
Botswana 1984	17.7	84	63	84	63	86	61
Cameroon 1978	17.5	81	73	86	72	64	76
Ghana 1979–80	19.3	72	68	79	73	61	57
Ivory Coast 1980–81	17.8	80	71	82	71	77	72
Kenya 1977–78	19.9	65	73	68	74	52	66
Lesotho 1977	19.6	69	67	73	67	41	68
Mauritania 1981	19.2	72	83	70	79	73	88
Nigeria 1981–82	18.5	76	70	80	73	63	58
Senegal 1978	17.7	77	88	90	90	57	83
Senegal (Sine-Saloum) (rural) 1982	17.2			83	89		
Sudan (north) 1978–79	21.3	57	76	62	77	45	75
ASIA & PACIFIC							
Bangladesh 1975–76	16.3	94	98	94	99	82	95
Fiji 1974	21.8	48	66	53	67	44	65
Indonesia (Java & Bali) 1976	19.4	71	87	78	89	47	77
Korea, Rep. of 1974	23.2	15	70	21	79	13	62
Malaysia (peninsular) 1974	23.1	37	72	45	81	23	54
Nepal 1976	17.1	84	79	NA	NA	NA	NA
Pakistan 1975	19.8	69	88	74	88	58	89
Philippines 1978	24.5	30	49	38	54	21	39
Sri Lanka 1975	25.1	27	57	28	61	24	42
Thailand 1975	22.5	42	47	45	59	26	44
Thailand 1978	21.4	41	44	45	47	27	30
LATIN AMERICA & CARIBBEAN							
Barbados 1980–81***[b]	20.1	60	55				
Brazil							
Amazonas (urban) 1982	22.6					35	29
Northeast region 1980	22.2	36	33	41	30	33	35
Piauí 1979	21.9	36	36	43	34	25	40
Piauí 1982	21.1	35	35	41	35	29	33
São Paulo 1978	23.0	†	†	†	†	†	†
Southern region 1981	21.7	41	39	44	41	40	38

tries on the average number of children ever born to women who were age 45–49 at the time of the survey. In all but 2 of the 29 countries, women who had married at age 22 or later had had an average of at least 0.5 fewer children than women who had married at ages 18–19. In 15 of the 29 countries, women who had married at ages 20–21 had had at least 0.5 fewer children on average than those who married at 18–19. Where use of contraception was common, the association between age at marriage and completed family size was weaker, but it was not eliminated (582).

The most direct link between age at marriage and fertility is that women who marry later spend less time exposed to the risk of conception. There are other links as well. On average, older women may be slightly less fertile. Also, women who marry later are more likely to use contraception. Both later marriage and more contraceptive use are characteristics associated with these women's greater education, higher incomes, and tendency to live in urban areas. Together, factors favoring lower fertility among those who marry later more than offset the tendency to have children in quick succession to catch up to those who married earlier (339). Thus, on balance, those who marry later have fewer children (see **Population Reports**, *Age at Marriage and Fertility*, M-4, November 1979).

A rise in the age at marriage would have the greatest effect on fertility levels where many women marry before their early to mid-20s—mainly in Africa. In nearly every African country the singulate mean age at marriage for women—the average age at marriage among those ultimately marrying—was under 20 at the time of the survey (see Table 13). In Asia average age at marriage was under 20 in Bangladesh (1975–76), Indonesia, Nepal, and Pakistan but over 23 in South Korea (1974), Malaysia (1974), the Philippines (1978), and Sri Lanka (1975). In Latin America and the Caribbean the average age at marriage was below 20 in El Salvador, Guatemala (1978, 1983), Jamaica (1983), and Mexico (1979) and between 20 and 23 elsewhere. In the Middle East the average age at marriage was between 21 and 24 except in Yemen Arab Republic, where it was below 20.

In most developing countries age at marriage appears to be rising or remaining steady. These observations are

Table 13 (continued). Age at Marriage

Region, Country & Year	Singulate Mean Age at Marriage[a]	% Married Before Age 20					
		Total		Rural		Urban	
		Women 20–24	Women 40–44	Women 20–24	Women 40–44	Women 20–24	Women 40–44
Colombia 1976	22.1	42	45	52	48	38	43
Colombia 1980	23.0	34	34	44	44	27	31
Costa Rica 1976	22.7	40	42	52	51	30	33
Costa Rica 1981	22.3	39	44	46	48	33	41
Dominican Rep. 1975	20.5	61	69	72	74	53	65
Dominican Rep. 1983	21.2	54	63	60	67	51	59
Ecuador 1979	22.1	46	54	53	58	41	50
El Salvador 1978	18.9	†	†	†	†	†	†
Guatemala 1978	19.8	†	†	†	†	†	†
Guatemala 1983	19.9	59	55	64	58	41	43
Guyana 1975[b]	20.0	62	72	61	79	62	57
Haiti 1977	21.8	48	56	48	52	47	64
Haiti 1983	21.0	47	45	48	45	43	49
Honduras 1981	21.1	59	60	73	65	43	53
Jamaica 1975–76[b]	19.2	77	57	78	60	76	53
Jamaica 1983[b]	16.8	83	83	81	82	84	84
Mexico 1976–77	21.7	51	60	65	68	44	54
Mexico 1979	18.3	50	56	59	63	42	50
Panama 1976	21.2	46	60	61	69	37	55
Panama 1979–80	21.6	42	44	52	46	36	42
Paraguay 1977	21.4	†	†	†	†	†	†
Paraguay 1979	22.1	41	54	48	64	33	44
Peru 1977–78	23.2	37	50	53	54	32	47
Peru 1981	22.2	42	47	62	49	35	46
Trinidad & Tobago 1977	20.9	56	71	54	77	58	68
Venezuela 1977	21.8	45	59	70	65	41	58
MIDDLE EAST & NORTH AFRICA							
Egypt 1980	21.3	54	76	69	80	36	72
Jordan 1976	21.6	54	75	71	85	47	71
Jordan 1983	23.8	26	45	27	35	26	49
Morocco 1979–80	21.3	53	85	65	85	37	84
Syria 1978	22.1	50	56	56	53	44	59
Tunisia 1978	23.9	29	59	36	58	23	61
Yemen Arab Rep. 1979	16.9	84	76	NA	NA	NA	NA

NA = Not available

†Women were not asked age at marriage

**Sample is combined rural/urban; no breakdown is available.

Source for WFS data: Ebanks & Singh (327), World Fertility Survey (140)

[a]Or start of first union. Definitions vary among surveys. Singulate mean age at marriage is derived from a set of proportions of people single at each age—thus it is, roughly, the average age at first marriage among all those who eventually marry. Since later marriage may be as much as 5–10 years later than the mean, whereas earlier marriage is normally only 2–3 years earlier, mean age at marriage is usually higher than median age at marriage.

[b]Includes steady visiting unions (Guyana and Jamaica 1975–76) or all visiting unions (Barbados and Jamaica 1983)

Breast-Feeding and Fertility

Surveys are a major source of data on breast-feeding practices in developing countries. They show that most women breast-feed their children, at least initially. The duration of breast-feeding has apparently been declining in some countries, however. Breast-feeding is nutritionally important and also protects both infant and maternal health by preventing closely spaced pregnancies (see **Population Reports**, *Breast-Feeding, Fertility, and Family Planning*, J-24, November-December 1981).

Prevalence of Breast-Feeding

In most Asian, African, and Latin American and Caribbean countries, the vast majority of women breast-feed their children, at least for a few months. In an analysis of WFS data for 28 countries, between 72 and 98 percent of children born within 10 months of the survey were breast-fed. Breast-feeding was nearly universal in Africa and Asia. Within these areas breast-feeding was most prevalent in Kenya, Senegal, Sudan, Bangladesh, and Nepal, where 98 percent had been breast-fed. In Africa and Asia breast-feeding was least prevalent in Fiji (86 percent), the Philippines (86 percent), and Malaysia (73 percent). Percentages ever breast-fed were smaller on average in Latin America and the Caribbean but even there ranged from 74 percent in Costa Rica to 97 percent in Haiti (261).

The average duration of breast-feeding varies considerably, from more than two years in some Asian countries to less than six months in most of Latin America and the Caribbean. The longest average durations are in Bangladesh (29 months), Nepal (24 months), Sri Lanka (20 months), and Indonesia (22 months). Average length of breast-feeding in the other Asian countries studied ranged from 6 months in Malaysia to 18 months in Thailand and Pakistan. In the four African countries analyzed—Kenya, Lesotho, Senegal, and Sudan—the averages ranged from 15 to 18 months. Average lengths of breast-feeding in Latin America and the Caribbean ranged from six months to one year in most countries (261).

Although data are limited, there is some evidence that the duration of breast-feeding has been falling. In Thailand, four surveys taken between 1969 and 1979 found that the average duration of breast-feeding fell from about 22 months to 18 months in rural areas and from 13 months to 8 months in urban areas. There was little or no change, however, in the percentage of children ever breast-fed (569, 570). In Taiwan three surveys between 1967 and 1980 showed that the average length of breast-feeding fell from about 14 months in 1967–68 to about 4 months in 1979–80. At the same time the percentage of infants ever breast-fed fell from about 93 to about 50 (592). Other researchers note that the duration of breast-feeding is shorter among younger women. It is also shorter in most modernized areas and among urban women, well-educated women, and women employed away from home. Since the number of women in these categories is increasing, this further suggests that the average duration of breast-feeding is now declining and will continue to decline (140, 475, 484, 558, 566, 575, 623).

In itself, shorter breast-feeding would mean an increase in fertility, but the trends linked with shorter breast-feeding also are linked with more contraceptive use and later marriage, which may offset part or all of the fertility increase (592, 649).

Benefits of Breast-Feeding

Breast-feeding has direct benefits for infants. Breast milk contains substances that guard infants against infection. Breast milk satisfies virtually all nutritional needs for the first four to six months of life and remains an important source of nutrients after supplementary foods are introduced. Breast milk is nutritionally better than substitutes, even when they are not diluted, as they often are in poor families (536, 588). Breast-feeding also has an indirect benefit for infant health by suppressing ovulation and thus preventing another pregnancy. In most areas of Costa Rica and eight Brazilian states, CPS data show that, where the average length of breast-feeding was less than eight months, the postpartum infertile period was less than five months. In Guatemala, where women breast-fed their children for 18 months on the average, the infertile period was about 12 months (598).

Longer infertile periods contribute to longer intervals between births, which are important to infant health (482, 532, 657, 686) (see p. M-325). Breast-feeding lengthens the interval between births to varying degrees in different countries. According to an analysis of WFS data, each month of breast-feeding lengthened the birth interval about 0.7 months in Sri Lanka; 0.5 months in Indonesia, Colombia, and Panama; 0.4 months in Bangladesh and Peru; and 0.3 months in Jordan and Guyana (558).

In addition to the biological effect, cultural traditions associated with breast-feeding can reduce fertility. In some societies where women breast-feed for long periods, social norms against sexual intercourse during breast-feeding help women avoid pregnancy even after ovulation resumes (527, 566). Postpartum abstinence is particularly important in Africa, where substantially more women were practicing abstinence than were using contraception (see Table 14).

Survey data on breast-feeding have important policy implications (140). First, the importance of breast-feeding to infant health should be made clear, both to medical personnel and to mothers. According to FP/MCH survey data from northeastern Brazil, women who had contact with health services breast-fed their children for a shorter time than those who had no contact, even when differences in women's education and urban or rural residence were taken into account. Further, 30 percent of women who were giving a milk substitute to their children under age two said that they had been advised to do so by a doctor or nurse (484, 485). Second, as the duration of breast-feeding continues to decline, family planning programs should focus on providing contraception before an unwanted pregnancy can occur (140, 588, 650).

made by comparing the percentages who married before age 20 among women age 20–24 at the time of survey and among those age 40–44 (see Table 13). In almost all countries of Asia and the Middle East, age at marriage appears to be higher among the younger women. In Latin America and the Caribbean, age at marriage seems to be rising in some countries and remaining the same in most of the others. Among African countries age at marriage seems to be rising in Kenya, Mauritania, Senegal (1978), and Sudan. Age at marriage seems to be falling in Benin, Botswana, Cameroon, Ghana, Ivory Coast, and Nigeria, although bias in the survey data cannot be ruled out. In some areas of the world age at marriage appears to be rising in urban areas but falling in rural areas—for instance, Cameroon, Piauí (1982) and northeast Brazil, and Peru (1981).

Marital disruption also reduces completed family size, but the effect is smaller than the effect of older age at marriage. A study of WFS data from 10 Asian countries found that, all else being equal, women who have been widowed, divorced, or separated, even if they remarried, had fewer children than other women (670). Women in developing countries spend most of their childbearing years in union, however. In a study of WFS data from 27 countries, the women surveyed spent an average of 18 of the 25 years between ages 15 and 39 in union, with a range from 15 years in Colombia and Costa Rica to over 22 years in Bangladesh (289). Marriages are generally stable. In 19 of 28 countries, ever-married women age 40–49 had averaged 1.2 or fewer partners—equivalent to 80 percent or more having only one partner (582).

Polygamy is often thought to reduce fertility. Surveys show that polygamy is common in a number of African countries, including Senegal, where 67 percent of women surveyed were in polygamous marriages; Nigeria, 43 percent; Cameroon, 39 percent; Ghana, 34 percent; and Kenya, 30 percent (5, 16, 31, 49, 261). In other African countries polygamy was less common, reported by 17 percent in Sudan (60) and 9 percent in Lesotho (34, 35). In all these countries the great majority of women in polygamous marriages reported that they had one co-wife. Polygamous marriages were less common among better educated women. They were also less common among younger women than older women. This may be because polygamy is becoming less popular or because men take a second wife only when they—and their first wives—are older. Where polygamy is common, it is found in all religious groups. In Ghana, for instance, polygamy was reported by 27 percent of Catholics, 29 percent of other Christians, 45 percent of those of traditional religions, and 47 percent of Muslims (16). Patterns in Cameroon, Kenya, and Nigeria were similar (5, 31, 49). Polygamy is also found in the Middle East and North Africa, but at much lower levels. Analysis of the relationship between polygamy and fertility based on WFS data is underway (619). Survey data will make possible a more comprehensive analysis of the relationship than has been possible in the past.

Table 14. Percentage of Currently Married Women Age 15–44 Practicing Abstinence, World Fertility Survey in Selected African Countries, 1977–1982

Country & Year	% Practicing Abstinence: Total	Post-partum	For Contraception	% Using All Other Contraceptive Methods
Benin 1981–82	47	43	4	4
Cameroon 1978	30	30	†	3
Ghana 1979–80	28	25	3	7
Ivory Coast 1980–81	36	34	2	1
Kenya 1977–78	11	10	1	6
Lesotho 1977	33	33	†	5
Nigeria 1981–82	35	34	1	1
Sudan (north) 1978–79	8	8	0	5

Note: If a woman said that she had not resumed sexual relations since the birth of her last child, she was classified as practicing postpartum abstinence even if she said she was abstaining for contraceptive purposes. Only women who said that they were practicing abstinence for contraceptive purposes *and* who were *not* postpartum were classified as practicing abstinence for contraception.

†Question not asked

INFANT AND CHILD MORTALITY

Fertility and family planning surveys show that levels of infant and child mortality in developing countries, while still higher than in developed countries, have been declining. Also, survey data have identified the infants most at risk of dying. They include infants of very young women, older women, women with many children, and women who have closely spaced births. Thus survey findings show that the healthiest pattern of childbearing is for births to take place between ages 18 and 35 and at least two years apart, and to be limited to four (see **Population Reports**, *Healthier Mothers and Children Through Family Planning*, J-27, May-June 1984). Maternal age, parity, birth order, and birth spacing are interrelated, however, making it difficult to assess precisely how much difference any one factor makes.

Surveys can often provide more accurate estimates of mortality levels than vital registration systems. WFS estimates of infant mortality rates are usually higher than UN estimates based on vital statistics (279, 507). Assuming that women are unlikely to report more deaths than actually occurred, this difference suggests that vital registration systems miss more deaths than surveys do.

Levels and Trends in Infant and Child Mortality

Infant mortality rates vary widely among countries. In the WFS the infant mortality rate (IMR)—the number of deaths of children under age one per 1,000 live births—ranged from 33 in Panama and Portugal to 162 in Yemen Arab Republic (279, 507) (see Table 15). In 7 countries IMRs were below 50; in 21 countries they were between 50 and 100; and in 12 countries they were above 100. In general, IMRs were highest in South Asia, the Middle East, and sub-Saharan Africa. They were lower in Latin America and the Caribbean. Even the lowest IMRs are higher than levels in developed areas, however. The IMR is about 8 in Japan and about 11 in the US (702).

Like infant mortality rates, mortality rates among children older than one year vary widely. Deaths among children between ages one and two ranged from under 5 per 1,000 children in Costa Rica, Portugal, and Trinidad and Tobago to over 50 in Nepal and Senegal. Deaths at ages two to five ranged from under 5 per 1,000 children in Costa Rica,

Table 15. Estimated Current Death Rates Among Infants, Toddlers, and Children, and Trends in Estimated Death Rates Among Infants Born to Women Age 20–29 at Time of Delivery, World Fertility Survey, Selected Countries, 1974–1982

Country, Region & Year	Current Death Rate[a] Among:			Infant Deaths per 1,000 Live Births to Women Age 20–29 at Delivery	
	Infants[b]	Toddlers[c]	Children[d]	0–4 Years Before Survey	15–19 Years Before Survey
AFRICA					
Benin 1981–82	108	37	74	102	156
Cameroon 1978	105	40	59	95	150
Ghana 1979–80	73	25	34	65	78
Ivory Coast 1980–81	113	17	38	101	170
Kenya 1977–78	87	28	33	83	121
Lesotho 1977	126	29	27	122	115
Mauritania 1981	90	45	74	82	112
Senegal 1978	112	74	103	120	106
Sudan (north) 1978–79	79	38	43	67	49
ASIA & PACIFIC					
Bangladesh 1975–76	135	35	68	117	140
Fiji 1974	47	5	7	42	59
Indonesia (Java & Bali) 1976	95	26	45	88	117
Korea, Rep. of 1974	42	7	8	35	64
Malaysia (peninsular) 1974	36	6	9	36	72
Nepal 1976	142	54	57	142	172
Pakistan 1975	139	33	48	132	156
Philippines 1978	58	16	22	52	55
Sri Lanka 1975	60	8	20	58	61
Thailand 1975	65	9	19	57	95
LATIN AMERICA & CARIBBEAN					
Colombia 1976	70	19	23	57	84
Costa Rica 1976	53	4	5	44	60
Dominican Republic 1975	89	25	19	81	72
Ecuador 1979	76	25	21	69	107
Guyana 1975	58	12	9	54	67
Haiti 1977	123	30	50	124	143
Jamaica 1975–76	43	8	5	39	79
Mexico 1976–77	72	13	14	60	86
Panama 1976	33	6	8	27	60
Paraguay 1979	61	15	10	52	43
Peru 1977–78	97	31	28	89	122
Trinidad & Tobago 1977	41	3	5	33	54
Venezuela 1977	53	6	6	45	45
MIDDLE EAST & NORTH AFRICA					
Egypt 1980	132	37	31	124	139
Jordan 1976	66	9	6	66	111
Morocco 1979–80	91	30	26	84	103
Syria 1978	65	12	11	63	86
Tunisia 1978	80	16	14	74	106
Turkey 1978	133	23	16	119	176
Yemen Arab Rep. 1979	162	42	50	163	237*

[a]Current rates are based on deaths in the 5-year period before the survey.
[b]Deaths in the first year of life per 1,000 live births
[c]Deaths in the second year of life per 1,000 age one
[d]Deaths 2-5 years following birth per 1,000 age 2-5
*Based on small sample

Source: Chidambaram et al. (507)

Portugal, and Trinidad and Tobago to over 70 in Senegal, Pakistan, and Benin.

In general, where overall mortality is low or falling rapidly, children's deaths tended to be concentrated in the first year and particularly in the first month of life. This reflects the fact that a larger proportion of deaths among older children result from infectious disease and gastrointestinal disorders that can be more easily prevented than some of the major causes of infant death (279, 507).

Rates of infant mortality and of all mortality before age five have declined in most developing countries. In some cases the declines have been substantial. Large and sustained mortality declines during the 20 years before the WFS are apparent in Jordan, Morocco, Peru, Thailand, and Turkey. On average, in these countries infant mortality fell 32 percent, and mortality among all children under age five fell 41 percent. Mortality dropped most sharply in the Ivory Coast, where the IMR fell from about 170 to about 100, and mortality among all children under age five dropped from about 290 to about 160 per 1,000 children (279, 507).

In some countries, however, mortality levels have remained steady or possibly have risen. In the Philippines, for example, infant mortality remained in the low 50s, and mortality among all children under age five, in the high 80s throughout the 20 years before the WFS. Mortality levels also remained fairly steady in Guyana, Pakistan, Sri Lanka, and Venezuela. Mortality apparently rose in Bangladesh in the years just before the WFS and perhaps in Jamaica, Mauritania, and Paraguay as well (507).

WFS data on infant and child mortality trends are subject to possible error from three sources. First, data are available only for women who were alive at the time of the survey. Bias could result if mortality among children of women who died differed from mortality among children of women who survived to be interviewed. If anything, the mortality rate probably would be higher for children whose mothers died. Second, reports of more distant births and particularly deaths may be omitted or misdated more often than recent births and deaths. If this is the case, mortality rates further back in time may be underestimated, thus underestimating the mortality decline as well and raising doubts about any apparent increases in mortality. Third, a large proportion of the women who gave birth 15 to 20 years before the survey had to have been very young at the time, since no women over age 49 are interviewed. High-risk births to very young women would thus be overrepresented, inflating the IMRs of several decades ago (699).

Mortality Differentials

Survey evidence confirms the benefit for infant and child survival if women avoid childbearing at a very young age, after age 35, or after four births. Survey data also provide the strongest evidence to date of the importance of child spacing.

Although there is little doubt that maternal age, family size, and birth spacing have an impact on infant mortality, there are methodological problems in determining the precise extent of the risks (687). Age, parity, and birth spacing are closely related to one another: women with

many children tend to have started childbearing at an early age, to be older, and to have had births close together (633). Very few studies have taken these three factors into account simultaneously, and thus it is difficult to measure separately their effects on infant and child mortality (657).

When maternal age is considered, mortality rates are lowest among infants and children of women age 20–29. A study of WFS data estimated mortality rates in 29 countries. Compared with the infants of women age 20–29, infant mortality was 33 percent higher when mothers were under age 20; 14 percent higher when mothers were 30–39; and 43 percent higher when mothers were 40 or older (279).

The effect of maternal age on infant and child health is more pronounced during the first year of life and where infant and child mortality rates are already low (279, 487, 507). This pattern reveals the importance of the biological effects of the mother's age, such as the mother's physical immaturity at a young age and the greater risk of premature birth and low birth weight at young and old maternal ages (633). Such biological effects pose the greatest hazard during the first month of life. Also, the relationship is more apparent where mortality from other causes, such as infectious diseases, has been reduced.

Mortality levels are higher among children whose mothers have had many births already. According to the WFS study, in 19 of 29 countries infant mortality rates were higher among children born fourth or later, and in 25 of the 29 countries infant mortality rates were higher among children born seventh or later. In addition, in about half of the countries, infant mortality rates were higher among first-born children than among second- or third-born children. Among children ages one to five, in most countries mortality rates are lowest for the first-born and increase steadily with birth order (279).

Short intervals between births pose especially high risks (521, 528, 551, 657, 688, 698). In nearly all WFS surveys, infants born within two years of an older sibling were more likely to die than those born two to three years after. The difference was largest in countries with high infant mortality rates. In Bangladesh, for instance, the mortality rate was 185 for infants born within two years after the previous birth and 89 for infants born after an interval of two to three years. The impact of birth interval was apparent, however, even in such low-mortality countries as Panama, where the mortality rate was 52 for infants born less than two years after the previous birth and 33 for infants born after an interval of two to three years (279, 507).

Survey data provide the strongest evidence to date of the importance of spacing births. These data allow researchers to avoid some of the methodological problems of previous studies (633). Recent studies using WFS data have found that the relationship between short birth intervals and high mortality persists even after taking into account factors such as premature births and breast-feeding, which affect both birth spacing and mortality. These two factors need to be taken into account because infants born prematurely, and thus after a shorter interval, are at higher risk of dying due to their prematurity, while breast-feeding both improves infant health and lengthens birth intervals (see box, p. M-322) (324, 551, 618).

Eliminating closely spaced pregnancies, pregnancies among young and old women, and pregnancies at high parity would reduce infant and child mortality substantially (654, 657). Using data, mainly from WFS, for 25 developing countries, James Trussell and Anne Pebley estimated that, if childbearing were confined to ages 20–34 and fourth and higher order births were avoided, the infant mortality rate would fall by about 12 percent on average. If all births were spaced at least two years apart, the infant mortality rate would fall 10 percent on average (657). On the basis of these figures, it has been estimated that, if all these high-risk pregnancies had been avoided, 5.6 million infant deaths in developing countries could have been prevented in 1984 (633). Using WFS data for six African countries, Deborah Maine and colleagues estimated that, if all births were spaced at least two years apart, 12 to 20 percent of infant deaths would be prevented (697).

WFS data confirm the widely observed excess of infant deaths among males. In 27 of 29 countries infant mortality was higher for males than females—16 percent higher on average. Between ages one and two, however, male mortality averaged one percent lower than female mortality, and between ages two and five, 4 percent lower (279, 507). Assuming no difference in the reporting of deaths among young children by sex, this suggests that male children, although biologically more vulnerable at birth than females, are better fed and cared for as they grow up.

Education and Infant Mortality

Mortality rates are lower among children of well-educated women (487, 500, 507, 552, 656). In Cameroon, for instance, IMRs were 116 if the mother had no education, 87 if she had one to six years of education, and 64 if she had seven or more years of education (507). Higher levels of education among husbands also were associated with lower mortality rates in a study based on 28 WFS surveys (140). To some extent education probably reflects the socioeconomic status of the couple, but education affects infant mortality even when other measures of socioeconomic status are taken into account (500, 552, 587, 656). John Caldwell and Peter McDonald have argued that the content of education is less important to infant survival than the exposure to modern culture, which breaks down traditional ideas such as that adult men should have most of the food and that women should not make decisions even when necessary to protect their children's health (500, 693).

Raising the average level of education for women could reduce infant mortality substantially. Studies by Linda Martin and colleagues and by James Trussell and Charles Hammerslough estimate that, if all mothers had at least seven years of education, infant mortality rates would fall 25 percent, even after taking account of factors such as age of mother, birth order, ethnic group, urban or rural residence, and various indicators of the standard of living (587, 656). Nonetheless, in developing countries levels of women's education reflect overall socioeconomic status and thus many other factors that influence infant and child mortality. It is not certain that mortality rates would fall as much as predicted if other changes did not accompany increases in education.

Differences in mortality levels also are related to community differences and differences in living conditions. In most countries infant mortality rates were higher in rural areas than in urban areas (488, 507). In a Philippine study infant mortality rates were lower in households with sanitation and electricity. In Panama, Sri Lanka, and Mexico, infant mortality rates were lower in households with access to toilet facilities (171, 301, 507, 587).

POLICY AND PROGRAM APPLICATIONS

Policy-makers and program administrators have made extensive use of WFS and CPS data. In some countries survey results have generated new interest in population issues or revealed previously unrecognized population problems. In most countries survey data have been or will be used to make the official population projections. Government family planning programs have used the data to assess program achievements, to increase program efficiency, and to define or redefine program goals (140).

In some countries survey data have prompted revision of population policies. In South Korea, for instance, WFS data revealed women's strong preference for sons. As a result, a thorough study of civil law, including traditional inheritance law, was made to identify biases against women. In Sri Lanka WFS data revealing the low level of contraceptive use were brought to the attention of economic planners and political leaders to obtain more support for the private family planning program. In several African countries survey results have alerted high-level officials to the need for new government policies and national family planning programs (140).

In many countries the process of conducting a family planning survey and publishing the results has generated much more open discussion of family planning. In Bolivia, because family planning was considered a very sensitive topic, the CPS conducted there in 1983 was called the Survey of Use of Medicines. Although the survey included standard CPS questions on family planning, the interview began with questions about medicine to avoid offending respondents. After the final results were made public at a conference in La Paz, however, public officials and policymakers were much more willing to discuss family planning. Further, CPS interviewers reported that women had been very eager to discuss the topic and were not at all offended (615).

Evaluating and Improving Programs

Government and private family planning programs have made wide use of WFS and CPS data to evaluate and improve their services. In Trinidad and Tobago, for instance, the government program began to focus on young women after WFS results revealed their particularly high pregnancy rate. In the Dominican Republic, because WFS found that most women already knew something about family planning, the emphasis of the government program was shifted from making women aware of family planning in general to making them familiar with specific family planning methods (140). In South Korea CPS data were used to set new program goals for the number of new clients—higher in some provinces and lower in others. Compared with earlier goals based on outdated census figures, the new goals more accurately reflected the number of women of reproductive age and the contraceptive prevalence in each province (604). In the Dominican Republic WFS and CPS data were used to estimate, by region, the increases in contraceptive prevalence that would be required to reduce the total fertility rate from 4.0 in 1985 to 3.6 by 1990. The regional estimates, ranging from 5 to 11 percent, were then translated into the number of additional clients that family planning programs would need to enroll in each region in order to raise prevalence accordingly. Overall, a 46 percent increase in the number of program clients would be needed (615). In Guatemala and Mexico the high percentage of pregnancies conceived before marriage, as revealed in surveys, raised concern and increased providers' willingness to consider the family planning needs of sexually active young adults. To find out more about their needs, special surveys of young people were conducted in both countries (598).

Where a new program is about to start or has just started, a survey can provide baseline data for comparison with later data. For example, in Piauí, Brazil, the 1979 CPS was conducted three months after the start of a new community-based distribution (CBD) program. Therefore the survey asked women about what method they were using and where they obtained supplies in the month before the new program started as well as at the time of the survey. Comparison showed that 50 percent of the OC users in the new program had switched from private sources of OCs, 6 percent had switched from less effective methods, and 44 percent were new users of family planning (636).

In many countries family planning programs have increased efforts in rural areas after surveys pointed out that contraceptive prevalence was much lower in rural than in urban areas. Examples include Honduras, where the 1981 CPS found that, among currently married women age 15–44, contraceptive prevalence was 47 percent in urban areas and 17 percent in rural areas; El Salvador, where the 1978 CPS found that prevalence was 48 percent in urban areas and 24 percent in rural areas; and Panama, where the 1976 WFS found that prevalence was 61 percent in urban areas and 47 percent in rural areas (140, 600, 615).

Public health programs also have been reoriented in response to survey findings. In Thailand the public health program began to focus on water supply and sanitation after WFS data showed that they were related to infant mortality (140). In Guyana WFS data on current and expected fertility levels were used to revise the goals of the infant immunization program (342). In many other countries—including South Korea, Pakistan, Sudan, Syria, Thailand, and Turkey—WFS data on infant and child mortality generated new interest in public health programs (140).

Survey data have been applied even more directly to specific program needs. Surveys have been especially useful to family planning programs for correcting service statistics; estimating the number of women whose need for family planning services is not yet being met; identifying groups of women, such as rural or young women, who need special attention; evaluating program components

such as information, education, and communication (IEC) activities, CBD projects, and social marketing programs; and identifying problems in service delivery.

Adjusting Service Statistics

Records kept by family planning programs can quickly become inaccurate. In most programs service statistics record new clients, not current users of family planning, although some record-keeping systems, such as in Indonesia, are designed to estimate current use. To estimate program coverage or prevalence, adjustments must be made for those who stop using family planning. This requires estimates of continuation rates, which can be difficult to make. Also, people who switch methods or clinics may be counted twice. Further, most programs have no record of people who move into or out of the area covered by the program (546, 653). Also, program statistics include no information on couples who obtain contraceptives from commercial outlets or private practitioners.

Surveys can be used to check and adjust estimates of program coverage based on service statistics. Comparisons of coverage estimates based on service statistics with survey data suggest that estimates from service statistics tend to overestimate the number of people currently using temporary methods supplied by the program. In Paraguay in 1977, for instance, estimates based on program statistics set the number of current users supplied by public or private family planning programs about 40 percent higher than survey results indicated. Service statistics did not record the extent of voluntary sterilization, however, which the 1977 CPS found accounted for over 15 percent of all program clients. In El Salvador 1975 CPS data suggested that service statistics overestimated use of OCs and IUDs by about 50 percent. A second CPS in 1978 suggested that the service statistics system had worsened, overestimating use by 68 to 87 percent. Overestimating continuation rates caused the problem (602, 604). In contrast, users of voluntary sterilization were underestimated because not all hospitals were part of the service statistics system.

Efforts to reconcile discrepancies between surveys and service statistics show that surveys are usually more accurate. A study in Bohol, Philippines, reinterviewed 196 women whose survey responses differed from clinic records. The women nearly always confirmed the survey results. For instance, clinic records identified 19 women as using rhythm, and the initial survey reported 47. Reconciliation interviews brought the total to 48. Clinic records reported 24 condom users; the initial survey found 6. Reconciliation interviews confirmed that 6 was correct (685).

Surveys are not always superior to service statistics, however. Some programs have accurate service statistics that do reflect current use (476, 636). Surveys cannot replace program statistics because surveys can only estimate contraceptive prevalence at one point in time, whereas service statistics provide a continuous record. Also, surveys usually do not interview enough people to provide accurate estimates for small areas. Especially for community-based programs, service statistics can provide better estimates of use in small areas (602, 653, 685). Service statistics also may provide more accurate information on the utilization of specific family planning organizations. For instance, in a survey women may not accurately distinguish between a privately supported family planning clinic and a government-run clinic.

Women may give inaccurate answers to other survey questions as well. Reinterviews with WFS respondents in Bangladesh, Fiji, Indonesia, Lesotho, and Peru showed that women did not always give the same answers in both interviews. Women were most likely to give different answers to questions about dates of events such as births or marriages and to questions that asked about attitudes rather than facts. Inaccurate answers may tend to make associations between variables appear weaker than they really are. Fortunately, changes in individual women's responses tend to cancel out. Thus national measures—such as the proportion married or the proportion using contraception—are fairly reliable (258, 341).

Inaccurate answers to survey questions proved to be a problem in Bangladesh. A survey reported far fewer condom users than had been estimated on the basis of sales by the Bangladesh Social Marketing Project. A subsequent survey of both men and women found that women were much less likely to report condom use than men (474, 526, 646).

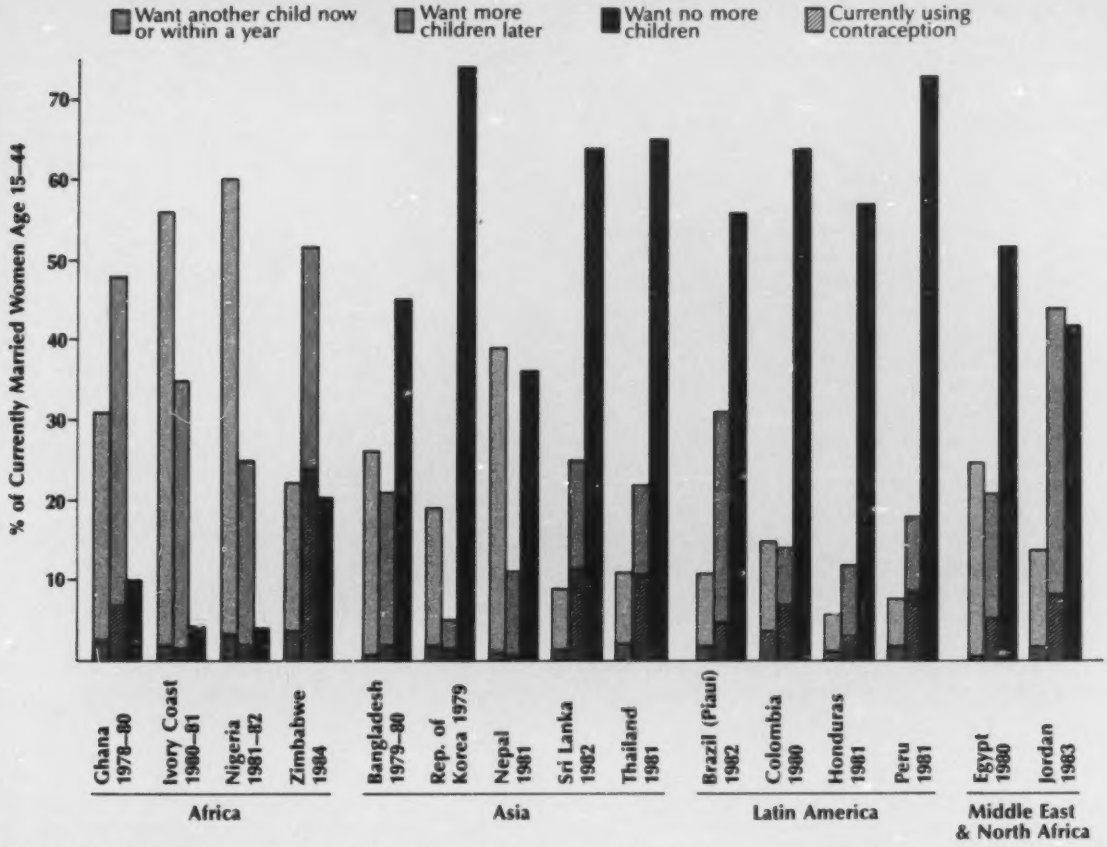
Estimating Unmet Need

Knowing the extent of unmet need for family planning and the characteristics of women in need of family planning helps family planning programs plan and direct their efforts. A variety of measures of unmet need have been derived from survey data. They differ in (1) what survey questions are asked to determine the desire to space or limit births; (2) whether pregnant, breast-feeding, or subfecund women are included; (3) whether desire to space childbearing, as well as to prevent all further childbearing, is considered; and (4) how the use of traditional, relatively ineffective methods is treated.

One measure of unmet need is the percentage of all married women of reproductive age who do not want a child immediately but are not using any form of contraception. In 21 of 29 countries, 75 percent or more said that they did not want another child now or within a year (see Table 7 and Figure 5). Of these women, the percentages who were not using any method of contraception range from about 30 in Costa Rica to nearly 100 in Mauritania and rural Senegal. By this measure, unmet need for contraception among women who did not want another birth immediately is greatest in Africa, where in most countries over 90 percent of these women were not using either modern or traditional family planning. The percentage was smaller in Asia, approaching 90 only in Bangladesh and Nepal. Elsewhere in Asia it ranged from 34 in South Korea (1979) to 60 in Malaysia. In Latin America between about one-third in Costa Rica and Panama and about two-thirds in Honduras and Guatemala did not want another child immediately but were not using contraception.

Survey data have been used to construct a variety of other measures of unmet need (353, 479, 494, 565, 597, 604, 613, 643, 680, 682). Using WFS data for 18 countries, Charles Westoff and Anne Pebley demonstrated that different definitions produced very different estimates of unmet need. While restricted by WFS data to considering only women who wanted no more births and not those who wanted to space them, Westoff and Pebley created 12 different measures of unmet need for family planning. Unmet need was

Figure 5. Desire for More Children and Contraceptive Use Among Currently Married Women Age 15–44, Contraceptive Prevalence Surveys, Selected Countries



Note: Percentage undecided or not stated is not shown (see Table 7). Thus total of the three columns shown for each country does not add to 100 percent.

In most countries large numbers of women want no more children, and many of these women are using contraception. Nonetheless, the family planning needs of a substantial number are not being met. Women who want to space births and have another child later but not now predominate in some African countries and Jordan. Except in Zimbabwe, however, only a small percentage of these women are using contraception to space births. In Ivory Coast, Nigeria, and Nepal, many women want another child immediately or within a year.

greatest—40 percent, on average—when defined as the percentage of currently married women who wanted no more children and who were not using a modern method of contraception. Unmet need was smallest—7 percent, on average—when defined most narrowly, as the percentage of currently married fecund women who wanted no more children, were not pregnant or breast-feeding, and were not using any method of contraception, traditional or modern (682).

Using data from 36 WFS and CPS surveys, Bryan Boulier also estimated unmet need for limiting births. He defined unmet need as the percentage of married women who wanted no more children, were not pregnant or infecund, and were not using a modern method of contraception. By this definition, unmet need ranged from one percent in Cameroon to 41 percent in Peru. Among regions, the greatest unmet need was in Latin America and the Caribbean and in Asia. Unmet need was less than 10 percent in sub-Saharan Africa—Cameroon, Ghana, Ivory Coast, Kenya, Lesotho, and Sudan—largely because most women wanted more children eventually (496).

For nine Asian and Latin American countries, Boulier estimated the unmet need for birth spacing separately. He found that it was less than for limiting births, although still substantial in some countries. The percentage of women with unmet need for spacing ranged from about 3 percent in Colombia and South Korea to 14 percent in Bangladesh. The need for spacing as a percentage of all unmet need ranged from 11 percent in Peru to 43 percent in Costa Rica (496).

When pregnant women are included—on the grounds that they will soon need contraception—estimates of unmet need are much higher. (For the percentage of women pregnant at the time of survey, see Table 9.) Dorothy Nortman estimated unmet need in this way for limiting and spacing in Bangladesh, Colombia, Costa Rica, South Korea, Mexico, and Thailand. With pregnant women included, the percentage of fecund women who wanted to prevent or postpone another birth but were not using a contraceptive method ranged from 22 percent in Costa Rica to 67 percent in Bangladesh. Unmet need for spacing ranged from 24 percent of total unmet need in South Korea to 55 percent in Bangladesh and Costa Rica (613).

Another analysis of unmet need included sexually active unmarried women. Leo Morris has calculated unmet need from 15 FP/MCH Surveys in Latin America. Among fecund, sexually active women (regardless of marital status) who were not pregnant and did not want a pregnancy at the time of the interview, the percentage not using contraception ranged from 3 to 5 percent in southern Brazil, where

contraceptive use is widespread, to 21 to 25 percent in Guatemala and Paraguay, where contraceptive use is slight. In northeast Brazil the percentage in need was about 65 percent higher in the states without family planning programs than in the states with programs (597).

Studies have found that unmet need is consistently greater in rural than in urban areas (479, 496, 598, 682). Also, unmet need is greater among high-parity women, poorly educated women, and low-income women (598, 682). These patterns reflect differences in the desire for more children and, especially, in contraceptive use.

Another indication of unmet need for family planning can be found in survey data: whether the most recent pregnancy was unwanted. For example, in 15 Latin American FP/MCH Surveys, between 7 and 33 percent of women said that their most recent pregnancies were unwanted. Another 5 to 25 percent said that they had wanted another pregnancy but it was mistimed. The lowest percentages of unwanted pregnancies were found in Guatemala, where many women wanted more pregnancies, and in Panama, where few women wanted more pregnancies but contraceptive use is widespread. The highest percentages of unwanted pregnancies were in some of the poor states of northeastern Brazil. Better educated women and women with higher incomes were more likely to have wanted their most recent pregnancies, perhaps because they had fewer children and because they were more likely to use contraception (598). The older WFS surveys found that even higher percentages of last or current pregnancies were unwanted in some countries—for example, 46 percent in Peru (1977–78), 42 percent in Colombia (1976), 37 percent in South Korea (1974), and 34 percent in Sri Lanka (1975) and Panama (1976) (353, 565).

Data on whether pregnancies are wanted or not can be used to create wanted total fertility rates (WTFR). The WTFR is the average number of children that a woman would have during her lifetime if, throughout her childbearing years, she followed the age-specific fertility rates that would currently prevail if no women had unwanted births. The difference between WTFR and the total fertility rate (TFR), an index of actual fertility, indicates unmet need for family planning (353, 579). Except in Africa, couples in surveyed countries averaged about two unwanted births. Differences between TFR and WTFR averaged 1.7 in Asia, 1.9 in Latin America, and 2.0 in the Middle East. Differences between the TFR and the WTFR were smallest in Africa—0.6, on average—since women reported most births as wanted. Still, WTFRs in Africa were lower than the actual fertility rates in every country analyzed except Mauritania (see Table 16).

In an analysis of WFS data from 40 countries, Robert Lightbourne showed that WTFRs, when compared with actual

Table 16. Total Fertility Rate, Wanted Total Fertility Rate, and Average Desired Family Size, World Fertility Survey, 1974–1982

Region, Country & Year	Total Fertility Rate[a]	Wanted Total Fertility Rate[b]	Average Desired Family Size[c]		
			All Women	Women 15–19	Women 45–49
AFRICA					
Benin 1981–82	7.1	6.9	7.6	7.2	8.0
Cameroon 1978	6.4	6.1	8.0	6.5	8.6
Ghana 1979–80	6.5	5.6	6.0	5.2	7.3
Ivory Coast 1980–81	7.4	7.0	8.4	7.5	9.6
Kenya 1977–78	8.3	6.9	7.2	6.6	8.7
Lesotho 1977	5.8	5.3	6.0	5.6	7.3
Mauritania 1981	6.3	6.8	8.8	8.3	9.4
Nigeria 1981–82	6.3	5.4			
Senegal 1978	7.2	6.7	8.3	8.3	8.4
Sudan (north) 1978–79	6.0	4.8	6.4	5.4	6.5
ASIA & PACIFIC					
Bangladesh 1975–76	6.1	3.1	4.1	3.7	5.0
Fiji 1974	4.2	3.6	4.2	2.7	6.1
Indonesia (Java & Bali) 1976	4.7	3.6	4.2	3.3	5.4
Korea, Rep. of 1974	4.3	2.5	3.1	2.7	3.8
Malaysia (peninsular) 1974	4.7	3.1	4.3	3.9	4.5
Nepal 1976	6.2	4.5	3.9	3.6	4.3
Pakistan 1975	6.3	3.9	4.2	4.0	4.5
Philippines 1978	5.2	3.6	4.3	3.0	5.6
Sri Lanka 1975	3.8	2.2	3.7	2.6	4.8
Thailand 1975	4.6	2.6	3.6	2.9	4.4
LATIN AMERICA & CARIBBEAN					
Colombia 1976	4.7	2.6	4.0	2.7	5.7
Costa Rica 1976	3.3	2.6	4.7	[d]	6.1
Dominican Republic 1975	5.7	3.0	4.7	3.4	6.0
Ecuador 1979	5.3	3.1	4.1	3.1	5.6
Guyana 1975	5.0	2.8	4.6	3.4	5.9
Haiti 1977	5.5	3.8	3.6	2.8	4.3
Jamaica 1975–76	5.0	2.3	4.1	3.3	4.8
Mexico 1976–77	6.2	3.6	4.4	3.8	5.8
Panama 1976	3.8	2.7	4.3	[d]	5.1
Paraguay 1979	5.0	4.2	5.2	3.7	7.1
Peru 1977–78	5.6	2.6	3.8	3.1	4.6
Trinidad & Tobago 1977	3.3	2.4	3.8	3.2	4.8
Venezuela 1977	4.5	2.9	4.3	3.0	[d]
MIDDLE EAST & NORTH AFRICA					
Egypt 1980	5.3	3.1	4.1	4.2	4.7
Jordan 1976	7.5	5.1	6.2	4.9	7.5
Morocco 1979–80	5.9	3.7	4.9	4.3	6.6
Syria 1978	7.5	5.6	6.1	5.0	7.1
Tunisia 1978	5.9	3.6	4.1	3.7	4.4
Turkey 1978	4.5	2.4	3.0	2.8	3.1
Yemen Arab Rep. 1979	8.5	7.4	5.5	4.5	6.9

[a]The number of children a woman would bear if she passed through her life bearing children at the same rate as are currently being born by women in each 5-year age group. Based on births in the 5-year period before the survey.

[b]The number of wanted births a woman would have if she passed through her life having, in each 5-year period, only the number of wanted births that women in each 5-year age group are currently having. Based on wanted births in the 5 years preceding the survey.

[c]Each woman's desired family size was measured by asking her how many children she wanted: "If you could choose exactly the number of children to have in your whole life, how many would that be?"

[d]No women in category were included in survey.

Source: For columns 1 and 2, World Fertility Survey (140); for columns 3-5, Lightbourne (580)

Contributions of WFS and CPS to Research Methodology

As a result of WFS and CPS, new research methods have been developed, and existing methods have been improved or applied to the population field for the first time. The WFS program, especially, emphasized the development of survey methodology and data analysis techniques (645).

Before the WFS and CPS programs began, much population research had to rely on censuses and vital statistics. This limited analysis because the reasons behind individual fertility decisions had to be inferred from data on groups of people. WFS and CPS surveys have provided a large body of data in which an individual's characteristics can be linked with her behavior. Many new research techniques have been developed to take advantage of such data. The staffs of the WFS and CPS programs as well as many other researchers have contributed.

A new form of regression analysis, called multilevel analysis, has been developed to take advantage of the individual-level data available from WFS. Multilevel analysis permits study of the relationship between statistical associations at two or more levels—for instance, individuals and countries. A multilevel analysis of fertility rates, for example, assumes that fertility in an area is influenced both by the characteristics of the individuals there—for instance, their education or income—and by the setting itself—for instance, access to family planning services or level of socioeconomic development. Regression coefficients from the individual-level model become dependent variables to be explained by characteristics of the country. Thus the analysis explains, in terms of national characteristics, why the effect of individual characteristics on fertility varies from country to country (128, 525, 689, 695, 696).

As extensive survey data have become available, researchers have been able to make more use of life table models, sometimes known as hazards models (163, 344, 656). Life table models estimate the probability that a specific event will occur during a given time period. They have been applied to survey data to estimate the probability of divorce (231), to predict age at first marriage (161, 242), to estimate durations of breast-feeding (217, 275), and to measure infant and child mortality (344, 551). Life table models also have been used to adjust data to minimize two problems inherent in surveys, selectivity and censoring, which arise because not all women surveyed have had a full opportunity to experience the event of interest (224).

Because of recent advances in life table analysis using survey data, the probability of an occurrence can be estimated separately for each group of women with a specific combination of many characteristics such as age at marriage, years of education, and number of children. Previously, life table analyses could consider only a few characteristics at one time (656).

In addition to developing or improving general statistical approaches, WFS and CPS data have been used to create more specific statistical measures or have provided the opportunity to apply existing measures to the population field. A new method developed to calculate an important measure is the prevalence method of estimating mean duration of breast-feeding, developed by W. Henry Mosley and colleagues: the number of women currently breast-feeding, regardless of the age of the child, is divided by the number of births to all women over the past year. The prevalence method requires far fewer data than methods based on complete breast-feeding histories; it is easily calculated; and it is accurate (223, 261). This method was developed, using WFS data, for use with surveys that do not ask for complete breast-feeding histories. It makes possible analyses of breast-feeding from CPS data (484).

One measure that has been refined through application to survey data is the P/F ratio—an estimate of recent fertility that compares data on numbers of children ever-born, or parity (P), with estimates of age-specific fertility rates (F). As survey data have become more available, the P/F ratio has been adapted to evaluate the quality of data from birth histories (550).

Sophisticated analyses of birth intervals have been made possible by the complete birth history data from WFS and two numerical measures that summarize birth interval data—the quintum and trimean (224, 344). One of these, the quintum, was developed specifically for application to WFS data. These measures facilitate comparisons among countries or subgroups of the population.

WFS data also have been used to improve and extend a statistical model, originally developed by Ansley Coale, that estimates the average age at which women marry and the proportion of women eventually marrying. This model has been refined by Germán Rodríguez and James Trussell through the use of WFS data. The model also has been successfully applied to analyzing age at first birth (161, 344).

Another contribution of the WFS program was to design and make available computer software to analyze survey data. Some examples of software packages include DEIR, which checks dates in WFS marriage and birth histories; FERTRATE, which calculates several kinds of fertility rates; and CLUSTERS, which calculates standard errors (344). A list of computer software available from WFS is included in Appendix 17 of the WFS Final Report (357). WFS also has published a software user's manual (149).

Along with improving research methodology, WFS and CPS have provided training in survey planning, implementation, and analysis to an international community of demographers and statisticians. One result of this transfer of knowledge and skills is that five countries where WFS or CPS surveys were conducted with outside assistance have since conducted similar surveys on their own (see box, p. M-308). Not only in the 60 some developing countries formally participating, but also in international agencies, other governments, universities, and training centers, these surveys have demonstrated the value of improved data and have taught the skills necessary to obtain such data.

TFRs, suggest greater potential for fertility declines than do women's statements of desired family size (see Table 16). Lightbourne argues that the WTFR is a better measure of the number of children women really want. Apparently a woman is more likely to count in unwanted births when she states desired family size than she is to claim that her last birth was wanted when it was not (579).

The percentage of first pregnancies conceived before marriage suggests the level of unmet need for contraception among young people. An analysis by Leo Morris found that such levels were high in parts of Latin America. In 15 Latin American FP/MCH Surveys, between 22 and 56 percent of women married no more than five years reported that their first birth had occurred before eight months of marriage (598).

Evaluating IEC Activities

Surveys can be used to evaluate family planning information, education, and communication (IEC) efforts. CPS surveys have found that mass media family planning messages reached the majority of women in the five Latin American and Caribbean countries where specific questions on IEC were asked: about 65 percent in Guatemala and Costa Rica (1978), over 85 percent in Panama (1979), and over 90 percent in El Salvador (1978) and Jamaica (1979). Family planning messages reached the largest audiences via radio in four of the five countries, ranging from 56 percent of all women of reproductive age in Costa Rica to 91 percent in Jamaica. In Panama more women had seen family planning posters—64 percent—than had heard radio messages—47 percent (368, 492, 614, 622). Of course, these figures reflect women's exposure to media and recall of messages as well as the design and extent of program IEC efforts.

Women who have heard or seen IEC messages are more likely to know about and to use contraception. In an analysis of CPS data from Guatemala, El Salvador, and Panama, this relationship was strong even after age, education, employment, number of children, and urban or rural residence were taken into account (492). In Barbados women who listened to radio programs or watched television programs on family planning were more likely to have used the services of the Barbados Family Planning Association than women who were unaware of the radio and TV programs (397). Surveys cannot isolate the effect of IEC activities on contraceptive use. Women who are highly motivated to use contraception probably are more likely to notice and remember IEC messages from whatever source.

Surveys can be used to identify groups that require special IEC efforts. In Guatemala the 1978 CPS reported that women with little education, the unemployed, and rural women, especially Indian women, were least likely to have heard IEC messages. To reach these women, the Asociación Pro-Bienestar de la Familia de Guatemala (APROFAM) has since made special efforts, such as broadcasting radio messages in two Indian dialects and training rural promoters to be sensitive to traditional Indian views about family planning (540, 622).

Surveys can identify the communication medium that will reach the largest audience. According to CPS data, in Guatemala, El Salvador, and Panama, many more people have access to radios than to television sets—over one-third more in Panama and about three times as many in Guatemala and El Salvador (492). Television is spreading rapidly, however. In Guatemala in 1978, 21 percent of women owned TV sets; in 1983, 30 percent (488, 622). Information about the most popular broadcast programs and the time of day when the audience is largest is useful for scheduling family planning messages. In Guatemala, El Salvador, and Honduras, music and news programs are the most popular on radio. In all three countries peak listening hours are in the morning—7 or 8 am to 12 noon (416, 491, 622).

Testing Use of Specific Brands of Contraception

To measure the impact of social marketing programs, special questions have been added to surveys asking women to name the brands of contraceptives they used. In the 1978 El Salvador CPS about 13 percent of condom users named *Condor*, the social marketing brand, which had been introduced that year. Nearly half of the women could not remember or did not know the brand name of the condoms they used, however, probably because their partners bought them. This suggests that it might be necessary to interview men about the use of male contraceptive methods (369). In the 1979 Bangladesh CPS, over 70 percent of OC users and 66 percent of condom users named the brands sold by the government program. In addition 3 percent of OC uses and 32 percent of condom users named the brands sold by the Bangladesh Social Marketing Project (372).

Testing New Delivery Systems

CPS surveys have been used to find out whether women would be interested in a community-based distribution (CBD) program and to measure the impact of existing CBD programs. In São Paulo State, Brazil, in 1978, 54 percent of women said that they would be willing to receive OCs or condoms from a trained distributor from their community. In the rural areas 66 percent were interested (398, 457). In El Salvador in 1978, 66 percent said they would be willing to visit a trained distributor in their community for services (377, 457). In 1980 in three Brazilian states—Rio Grande do Norte, Paraíba, and Pernambuco—both current clients of a CBD program and women who were interested in the program but not yet clients were asked where they would prefer to obtain their contraceptives: in their homes, in the home of a distributor, or, as the program operated, at a health post. Overall, home delivery was the favored choice, followed by health posts. In general, women who had never been program clients were more likely than past or current clients to prefer home delivery or a distributor's home. In contrast, past and current clients were more likely to prefer health posts (409, 634).

Improving Service Delivery

Surveys can identify problems in service delivery. In the 1984 Botswana CPS, former clients of the government family planning program who had stopped using contraception were asked why. Because many women blamed side effects of contraceptive methods, the government program is improving follow-up of clients to address side effects (677). In northeast Brazil until 1979 the family planning programs of five state health departments offered only OCs, but discontinuation rates were fairly high. When FP/MCH Surveys confirmed that many women who had stopped using OCs blamed side effects, the program began to offer barrier methods along with OCs.

Survey results also have revealed interest in family planning methods that program officials previously considered undesirable or unacceptable. As a result, programs have begun to offer new methods. In many Latin American countries, for instance, surveys revealed that many women had obtained voluntary sterilizations, and successive surveys indicated rapid increases in the proportion of women relying on sterilization. As a result of these findings, sterilization services have been expanded, and in many countries public criticism of female sterilization has diminished. In Morocco the government family planning program supplied mainly OCs. CPS surveys in 1979–80 and 1981–82 revealed that many women not currently using contraception preferred IUDs or female sterilization. Since then the government program has been making these methods more widely available (489).

These examples illustrate some of the valuable contributions made by the World Fertility Survey and Contraceptive Prevalence Surveys. Not only are these programs primary sources of data on levels and trends in fertility and family planning practices, but they also are being put to wide practical use by program planners and policy-makers. By providing data to evaluate and direct programs, the WFS and CPS projects are helping to improve services that reduce fertility and promote family health.

Table 2. Participation of Developed Countries in WFS Program, 1973–1983

Region & Country or Area	Ref. No.	Date of Field Work	Implementing Organizations	Women Surveyed	Successful Interviews
Belgium (Flemish part)	77	1975–76	Department of Public Health and the Family	All age 20–44, married age 16–19	4,863
Bulgaria	354, 573	1976	Scientific Research Institute of Statistics	Ever-married age 15–44	6,911
Czechoslovakia	82	1977	Federal Statistical Office	Currently married age 18–44 in first marriage	3,041
Denmark	644	1975	Danish National Institute of Social Research	All age 18–49	5,240
Finland	632	1977	Population Research Institute	Currently married age 18–44 in first marriage	5,449
France	87	1977–78	Institut National d'Etudes Démographiques/Institut National de la Statistique et des Etudes Economiques	All born 1933–57 (age 20–44)	3,018 women 600 men[a]
Hungary	92, 556	1977	Hungarian Central Statistical Office	Married age 15–39 living with husbands	4,009
Israel	335, 354	1973–75	Central Bureau of Statistics/ Hebrew University of Jerusalem	All of reproductive age	6,000
Italy	94, 519, 520	1979	Universities of Padua, Florence, and Rome	Ever-married age 18–44	5,499 women 850 men[b]
Japan	97	1974	Ministry of Health and Welfare	Ever-married under age 50	2,860
Netherlands	107	1975	Netherlands Interuniversity Demographic Institute	Currently married who married 1963–73	4,522
Netherlands	672	1982	Netherlands Interuniversity Demographic Institute	All born 1945–64 (age 18–38)	6,660
Norway	109, 611, 614	1977–78	Central Bureau of Statistics	All age 18–44	4,137
Poland	651	1977	Central Statistical Office	Currently married age 15–44	9,799
Portugal	55, 56, 115	1979–80	National Statistical Institute/ WFS	Ever-married age 15–49	5,148
Romania	607	1978	Population Commission of Romania	Currently married age 15–49	10,141
Spain	117, 652	1977	Instituto Nacional de Estadística	Ever-married age 15–49	6,290
Sweden	120	1981	Statistics Sweden	All born 1936–60 (age 20–44)	4,300
Switzerland	553	1980	University of Zurich	Couples in first marriage, married 1970–1979	601 couples
United Kingdom (England, Wales, Scotland)	524	1976	Office of Population Censuses and Surveys	All age 16–49	6,589
United States	606	1976	National Center for Health Statistics	Ever-married age 15–44 and never-married age 15–44 with children	8,611[c]
United States	626	1982–83	National Center for Health Statistics	All age 15–44	7,969[c]
Yugoslavia	692	1976	Federal Institute of Statistics	Currently married age 15–49	8,115

Note: Surveys in the Netherlands 1982 (672) and US 1982–83 (626) were not part of the official WFS program.

[a]Husbands of female respondents born between 1943 and 1947 and between 1953 and 1957

[b]Husbands of a randomly selected subgroup of female respondents

[c]Excludes Alaska, Hawaii, and women in institutions

Table 1. Status of the World Fertility Survey and Contraceptive Prevalence Surveys as of September 1985

Region, Country or Area	Ref. No. of Main Report	Type of Survey	Date of Field Work	Implementing Organizations	In-Country Contact Person	Women Surveyed	Completed Interviews	Additional Questions, Modules Used/Supplementary Studies	Status as of September 1985
AFRICA									
Benin	2–4	WFS	1981–82	Institut National des Statistiques et de l'Analyse Economique/WFS	E. Amoussou	All age 15–49	4,018	General mortality (in part), FOTCAF	First country report completed**
Botswana	392	CPS	1984	MOH/WPAS	W. Manyeneng	All age 15–49	3,064	MCH	Final report in progress**
Cameroon	5, 6	WFS	1978	Ministère de l'Economie et du Plan/WFS	T. Komguep	All age 15–54	8,219	Community-level (in part), general mortality (in part), linguistic, FOTCAF	First country report completed**
Ghana	16, 17	WFS	1979–80	Central Bureau of Statistics/National Family Planning Secretariat/WFS	J.Y. Owusu	All age 15–49	6,125	FP, FOTCAF	First country report completed**
Ivory Coast	25, 26	WFS	1980–81	Ministère du Plan et de l'Industrie/WFS	N. Meite	All age 15–50	5,764 (husbands survey–506)	Community-level (in part), husbands survey, editing experiment, survey costs experiment, FOTCAF	First country report completed**
Kenya	31, 32	WFS	1977–78	Central Bureau of Statistics/WFS	O. Agunda	All age 15–50	8,100	FP (in part), FOTCAF	First country report completed**
Kenya	385	CPS	1984	Central Bureau of Statistics/WPAS	G.H. Olum	All age 15–49	6,581		Final report in progress
Lesotho	34, 35	WFS	1977	Bureau of Statistics/WFS	L.T. Tuoane	Ever-married age 15–49	3,603	General mortality, response error, FOTCAF	First country report completed**
Mauritania	37–39	WFS	1981	Direction de la Statistique et de la Comptabilité Nationale/WFS	Isselmou Ould Mohamed	Ever-married under age 51	3,504	Community-level (in part), general mortality, FOTCAF	First country report completed**
Mauritius		CPS	1985	MOH/CDC/UNFPA	V. Rajcoomar	Ever-married age 15–49	3,250*	Natural Family Planning, contraceptive continuation, sterilization demand	Field work in progress
Nigeria	48, 49	WFS	1981–82	National Population Bureau/WFS	B. Morah	All age 15–49	9,727	Community-level (in part), FOTCAF (in part)	First country report completed**
Senegal	57, 58	WFS	1978	Direction de la Statistique/WFS	A. Thiongane	All age 15–49	3,985	General mortality (in part), FOTCAF (in part)	First country report completed**
Senegal (Sine-Saloum) (rural)	382	FP/MCH	1982	Direction de la Statistique/MOH/CDC	F. M'Bodji	Ever-married age 15–49	1,894	Childhood morbidity and mortality, nutrition (anthropometric measurements), prevalence and treatment of diarrhea	Final report completed**
Somalia (5 cities)	388	CPS	1983	MOH/WPAS	R. Seif	Ever-married age 15–49	3,016		Final report completed**
Sudan (north)	60, 61	WFS	1978–79	Ministry of National Planning/WFS	O.A. El-Tay	Ever-married under age 51	3,115	Community-level (in part), FP, general mortality, post-enumeration survey, FOTCAF	First country report completed**

Region, Country or Area	Ref. No. of Main Report	Type of Survey	Date of Field Work	Implementing Organizations	In-Country Contact Person	Women Surveyed	Completed Interviews	Additional Questions, Modules Used/Supplementary Studies	Status as of September 1985
Zaire (4 cities, 2 rural areas)	391	CPS	1982–84	Institut National de la Statistique/WPAS	B. Makani	All age 13–49	5,548	Questions on abortion and frequency of illness	Final report completed**
Zimbabwe	423	CPS	1984	National Family Planning Council/WPAS	E.S. Boohene	All age 15–49	2,584		Final report in progress**
ASIA & PACIFIC									
Bangladesh	1	WFS	1975–76	Ministry of Health, Population Control and Family Planning/WFS	S. Waliullah	Ever-married under age 50	6,504	Community-level (in part), abortion, economic (in part), fertility regulation, post-enumeration survey, FOTCAF	First country report completed**
Bangladesh	372	CPS	1979–80	Ministry of Health, Population Control and Family Planning/WPAS	S. Waliullah	Ever-married under age 50	15,481		Final report completed**
Fiji	15	WFS	1974	Bureau of Statistics/WFS	J. King	Ever-married age 15–49	4,928	Post-enumeration survey	Final country report completed**
Hong Kong[b]	22	WFS	1976–77	Census and Statistics Dept./WFS	C. Greenfield	Total population[c]			First country report completed
Indonesia (Java & Bali)	23, 24	WFS	1976	Central Bureau of Statistics/WFS	A. Rasjid	Ever-married under age 50	9,155	FP (in part), abortion (in part), fertility regulation, post-enumeration survey	Final country report completed**
Indonesia (5 cities)	418	CPS	1983	Faculty of Public Health, University of Indonesia/WPAS	B. Utomo	Currently married age 15–49	9,281	Supplementary study to evaluate a new urban delivery scheme	Final report completed**
Korea, Rep. of	33	WFS	1974	Economic Planning Board/Korean Institute for Population and Health/WFS	Y.J. Shin	Ever-married under age 50	5,430	Community-level (in part), abortion (in part), economic (in part), FP (in part), fertility regulation (in part), general mortality	First country report completed**
Korea, Rep. of	387	CPS	1979	Korean Institute of Family Planning/WPAS	T. I. Kim	Ever-married age 15–49	14,296		Final report completed**
Malaysia (peninsular)	36	WFS	1974	Dept. of Statistics/National Family Planning Board/WFS	A. Hamid	Ever-married under age 50	6,321	Community-level (in part), abortion, economic (in part), fertility regulation (in part), FP (in part)	First country report completed**
Nepal	47	WFS	1976	MOH/WFS	NA	Ever-married under age 50	5,940	FP, abortion (in part), fertility regulation (in part)	First country report completed**
Nepal	399	CPS	1981	Family Planning Maternal Child Health Project/WPAS	B.R. Pande	Currently married age 15–49	5,880		Final report completed**
Pakistan	50	WFS	1975	Ministry of Planning and Development/WFS	K. Siddiqui	Ever-married under age 50	4,952	Community-level (in part), abortion (in part), post-enumeration survey	First country report completed**
Pakistan		CPS	1984	Population Development Center/WPAS	K. Siddiqui	Ever-married age 15–49	5,000[a]	Supplementary study to evaluate World Bank and UNFPA project areas	Final report in progress

Philippines	54	WFS	1978	National Census and Statistics Office/WFS	M.M. Orense	Ever-married age 15–49	9,268	Community-level (in part), abortion, FP, fertility regulation, general mortality (in part), post-enumeration survey, FOTCAF	First country report completed**
Sri Lanka	59	WFS	1975	Ministry of Plan Implementation/Dept. of Census & Statistics/WFS	R.B.M. Korale	Ever-married under age 50	6,810	Fertility regulation, economic (in part)	First country report completed**
Sri Lanka	415	CPS	1982	Ministry of Plan Implementation/WPAS	W.A.A.S. Peiris	Ever-married age 15–49	4,500		Final report completed**
Thailand	64, 65	WFS	1975	National Statistical Office/ Institute of Population Studies/National Economic and Social Development Board/WFS	P. Pitaktepsombati	Ever-married under age 50	3,820 (husbands survey–2,967)	Community-level (in part), economic (in part), husbands survey	First country report completed**
Thailand	417	CPS	1978	National Institute of Development Administration/ Ministry of Public Health/ WPAS	T. Suvnajata	All age 15–49	4,025		Final report completed**
Thailand	384	CPS	1981	National Institute of Development Administration/ Ministry of Public Health/ WPAS	T. Suvanajata P. Kamnuansilpa	Ever-married age 15–49	7,038	Community characteristics	Final report completed**
LATIN AMERICA & CARIBBEAN									
Antigua	374	CPS	1981	Systems, Inc./WPAS	J. Davis	All age 15–49	943		Final report completed
Barbados	397	CPS	1980–81	Barbados Family Planning Association/WPAS	B. Springer	All age 15–49	1,463	Questions on exposure to family planning information, radio/TV	Final report completed**
Barbados		CPS	1982–83	Systems, Inc./WPAS	J. Davis	All men age 15–49	1,301	Some attitude questions	Final report in progress
Bolivia	375	CPS	1983	Consultora Boliviana de Reproducción Humana/ WPAS	E. Del Castillo	Ever-married age 15–49	5,069	Child health	Final report in progress**
Brazil									
Amazonas (urban)	367	FP/MCH	1982	BEMFAM/CDC/WPAS	J.M. Arruda	All age 15–44	2,100	Vaccination coverage, MCH, breast-feeding, sterilization demand, contraceptive side effects	Final report completed**
Northeast region (Bahia, Paraíba, Pernambuco, Rio Grande do Norte)	406–409, 411	FP/MCH	1980	BEMFAM/CDC/FHI	J.M. Arruda	All age 15–44	7,485	Sterilization demand, IEC, breast-feeding, CBD (except Bahia), vaccination coverage, MCH	Final reports completed**
Piauí	410	FP/MCH	1979	BEMFAM/CDC/Columbia University	J.M. Arruda	All age 15–44	1,978	Sterilization demand, CBD	Final report completed**
Piauí	366	FP/MCH	1982	BEMFAM/CDC/WPAS	A.M. Thome	All age 15–44	3,293	Breast-feeding, sterilization demand, CBD, contraceptive side effects, prevalence and treatment of diarrhea, vaccination coverage, MCH	Final report completed**

Region, Country or Area	Ref. No. of Main Report	Type of Survey	Date of Field Work	Implementing Organizations	In-Country Contact Person	Women Surveyed	Completed Interviews	Additional Questions, Modules Used/Supplementary Studies	Status as of September 1985
São Paulo	398	CPS	1978	Pontifícia Universidade Católica de Campinas/ CDC/FHI	M. Nakamura	All age 15–49	2,803		Final report completed**
Southern region (Paraná, Rio Grande do Sul, Santa Catarina)	412	FP/MCH	1981	BEMFAM/CDC/FHI	J.M. Arruda	All age 15–44	4,047	Sterilization demand, contraceptive side effects, breast-feeding, vaccination coverage, MCH	Final report completed**
Colombia	7	WFS	1976	Corporación Centro Regional de Población/Departamento Administrativo Nacional de Estadística/ WFS	G. López-Escobar	All age 15–49	5,378	FP, fertility regulation, abortion	First country report completed**
Colombia	376	CPS	1978	Corporación Centro Regional de Población/WPAS	J.A. Arias	All age 15–49	3,791		Final report completed**
Colombia	400	CPS	1980	Corporación Centro Regional de Población/WPAS	R. Heredia	All age 15–49	3,462	MCH	Final report completed**
Costa Rica	8	WFS	1976	Dirección General de Estadística y Censos/WFS	R. Trigueros	All age 20–49	3,935	FP, fertility regulation, abortion	Final country report completed**
Costa Rica	368	CPS	1978	Dirección General de Estadística y Censos/Asociación Demográfica Costarricense/WPAS	M. Gomez Barrantes	All age 15–49	3,400	IEC	Final report completed**
Costa Rica	413	CPS	1981	Asociación Demográfica Costarricense/WPAS	L. Rosero	All age 15–49	4,580	Community characteristics	Final report completed**
Costa Rica		CPS	1986	Asociación Demográfica Costarricense/CDC	J. Antillon	All age 15–49	4,000[a]	Breast-feeding, MCH, vaccination coverage	Field work planned
Dominica	374	CPS	1981	Systems, Inc./WPAS	J. Davis	All age 15–49	1,017		Final report completed
Dominica		CPS	1982–83	Systems, Inc./WPAS	J. Davis	All men age 15–49	961		Final report in progress
Dominican Republic	9	WFS	1975	CONAPOFA/WFS	R. Portes Carrasco	All age 15–49	3,115	Fertility regulation, response error	First country report completed**
Dominican Republic	379	CPS	1983	CONAPOFA/WPAS	L. Baez M. Molina	All age 15–49	4,741	Breast-feeding, CONAPOFA program variables, teen attitudes	Final report completed**
Dominican Republic	378	CPS	1984	CONAPOFA/WPAS	L. Baez M. Mejia	All men age 15–49	4,203		Final report completed
Ecuador	10	WFS	1979	Instituto Nacional de Estadística y Censos/WFS	W. Ruales	All age 15–49	6,797	Community-level (in part), economic (in part), fertility regulation	First country report completed**
Ecuador	380, 381	CPS	1982–83	Ministerio de Salud Pública/WPAS	M. Paredes	All age 15–49	4,306	Patterns of lactation, use of MCH services	Final report completed
El Salvador	605	CPS	1975	Asociación Demográfica Salvadoreña/CDC	D. Araya	All age 15–49	2,126		Final report completed
El Salvador	369	CPS	1978	Asociación Demográfica Salvadoreña/CDC	D. Araya	All age 15–44	2,323	Sterilization demand, IEC	Final report completed**
Grenada		CPS	1985	IPPF Western Region/CDC	W. Duncan	All age 15–44	1,000[a]		Field work in progress
Guadeloupe[b]	89, 502	WFS	1975	Institut National d'Etudes Démographiques/WFS	Y. Charbit	All age 15–49	1,440		First country report completed

Guatemala	404	FP/MCH	1978	Asociación Pro-Bienestar de la Familia de Guatemala/CDC	R. Santiso	All age 15–44	2,684	IEC	Final report completed**
Guatemala	405	FP/MCH	1983	Asociación Pro-Bienestar de la Familia de Guatemala/CDC	R. Santiso	All age 15–44	3,672	Sterilization demand, IEC, contraceptive side effects, prevalence and treatment of diarrhea, vaccination coverage, MCH	Final report completed**
Guatemala (Guatemala City)		TYA	1986	Asociación Guatemalteca de Educación Sexual/CDC	E. Monterroso	Males and females age 15–24	1,000 men 1,000 women	Sex education, sexual experience	Field work planned
Guyana	18, 19	WFS	1975	Ministry of Economic Development/WFS	B. Bowman	All age 15–49[d]	4,642	Fertility regulation	First country report completed**
Haiti	20, 21	WFS	1977	Institut Haitien de Statistique et d'Informatique/WFS	M. Duplan	All age 15–49	3,350	FOTCAF (in part)	First country report completed**
Haiti		CPS	1983	Division d'Hygiène Familiale/WPAS	S. Armond F. Pierre	All age 15–49	4,309	Breast-feeding, abortion, MCH	Final report in progress**
Honduras	416	CPS	1981	Ministerio de Salud Pública y Asistencia Social/ Asociación Hondureña de Planificación de Familia/Dirección de Estadística y Censos/WPAS	J.M. Vigil	All age 15–49	3,593	Breast-feeding, IEC, vaccination history	Final report completed**
Jamaica	27, 28	WFS	1975–76	Department of Statistics/ WFS	C. McFarlane	All age 15–49[d]	3,096	Economic (in part), fertility regulation	First country report completed**
Jamaica	624	CPS	1983	National Family Planning Board/WPAS	J.C. Rattray	All age 15–49	2,219	Breast-feeding	Final report completed**
Martinique[b]	89, 502	WFS	1976	Institut National d'Etudes Démographiques/WFS	Y. Charbit	All age 15–49	1,409		First country report completed
Mexico	40–42	WFS	1976–77	Dirección General de Estadística/WFS	C.M. Jarque	All age 20–49[e]	7,310	Community-level (in part), economic (in part), FP (in part), general mortality (in part)	First country report completed**
Mexico	394	CPS	1978	Coordinación de Programa Nacional de Planificación Familiar/WPAS	J.G. Nuñez	All age 15–49	4,492		Final report completed**
Mexico	395	CPS	1979	Coordinación de Programa Nacional de Planificación Familiar/WPAS	J.G. Nuñez	All age 15–49	15,349	Contraceptive continuation	Final report completed**
Mexico (Mexico City)		TYA	1985	Centro de Orientación para Adolescentes/Asociación Mexicana de Investigaciones de Demografía Médica/CDC/FHI	A.M. de Valasco	Males and females age 15–24	1,581 women 1,401 men	Sex education, sexual experience	Editing data tape
Montserrat		CPS	1984	IPPF Western Region/CDC	T. Jagdeo	Currently in union age 15–44	296		Final report in progress
Nicaragua (Boaco)	396	FP/MCH	1977	Ministerio de Salud Pública/CDC	NA	Ever-married or in union age 15–44	527	Vaccination coverage, MCH	Final report completed
Nicaragua		CPS	1981	Asociación Demográfica Nicaraguense/WPAS	E. Bandes	All age 15–49	3,344	Contraceptive side effects, abortion, method failure	Final report in progress

Region, Country or Area	Ref. No. of Main Report	Type of Survey	Date of Field Work	Implementing Organizations	In-Country Contact Person	Women Surveyed	Completed Interviews	Additional Questions, Modules Used/Supplementary Studies	Status as of September 1985
Panama	51	WFS	1976	Ministerio de Salud/WFS	J.A. Barahona	All age 20–49[c]	3,701	Fertility regulation, abortion	First country report completed**
Panama	393	FP/MCH	1979–80	MOH/CDC	F. Guerra	All age 15–44	2,347	Sterilization demand, IEC	Final report completed**
Panama		FP/MCH	1984–85	MOH/CDC	F. Guerra	All age 15–44	8,239	Sterilization demand, prevalence and treatment of diarrhea, childhood morbidity and mortality, vaccination coverage, MCH	Final report in progress**
Paraguay	365	CPS	1977	MOH/CDC	R. Kriskovich	All age 15–44	2,048		Final report completed**
Paraguay	52	WFS	1979	Ministerio de Salud Pública/Dirección de Estadística/WFS	J. Diaz de Bedoya	All age 15–49	4,622	FP, fertility regulation	First country report completed**
Peru	53	WFS	1977–78	Instituto Nacional de Estadística/WFS	G.F. Bacca de Valdéz	Ever-married age 15–49	5,640	Community-level (in part), fertility regulation, general mortality, response error	First country report completed**
Peru	403	CPS	1981	Instituto Nacional de Estadística/Ministerio de Salud Pública/WPAS	Y.Cespedes T.G. Diaz	All age 15–49	6,437	Prenatal care, abortion, general mortality	Final report completed**
St. Kitts/Nevis		CPS	1982–83	Systems, Inc./WPAS	J. Davis	All men age 15–49	967		Final report in progress
St. Kitts/Nevis		CPS	1984	IPPF Western Region/CDC	T. Jagdeo	Currently in union age 15–44	640		Final report in progress
St. Lucia	374	CPS	1981	Systems, Inc./WPAS	J. Davis	All age 15–49	987		Final report completed
St. Vincent	374	CPS	1981	Systems, Inc./WPAS	J. Davis	All age 15–49	987		Final report completed
Trinidad & Tobago	66, 67	WFS	1977	Central Statistical Office/WFS	L. Pujadas	All age 15–49[d]	4,359	Economic (in part), abortion, fertility regulation (in part)	First country report completed**
Venezuela	72, 73	WFS	1977	Oficina Central de Estadística y Informática/WFS	F. Ortega	All age 15–44	4,361	Economic (in part), FP, fertility regulation	First country report completed**
MIDDLE EAST & NORTH AFRICA									
Egypt	11–14	WFS	1980	Central Agency for Public Mobilisation and Statistics/WFS	A.M. Hallouda	Ever-married age 15–49	8,788 (husbands survey–2,312)	Community-level (in part), FP, fertility regulation, household economic survey, husbands survey, FOTCAF (in part)	First country report completed**
Egypt (rural)	386	CPS	1980	Population and Family Planning Board/WPAS	A. Khalifa	Ever-married age 15–49	5,313		Final report completed**
Egypt		CPS	1984–85	Population and Family Planning Board/WPAS	H. Sayed	Ever-married women age 15–49	10,000[e]	Supplementary study to evaluate Population & Development Project	Data processing completed
Iran		WFS	1977	Statistical Center of Iran/WFS	NA	Ever-married age 15–50	4,878 (husbands survey–c. 700)	Fertility regulation, husbands survey	Preliminary analysis completed
Jordan	29, 30	WFS	1976	Department of Statistics/WFS	B.N. Shrydeh	Ever-married age 15–49	3,610	Community-level (in part), abortion (in part), fertility regulation, general mortality	First country report completed**

Jordan	383	FP/MCH	1983	Department of Statistics/ CDC	B.N. Shrydeh	Ever-married age 15–49	3,939	Childhood morbidity and mortality, prevalence and treatment of diarrhea, vaccination coverage, MCH, breast-feeding,	Final report completed**
Jordan		CPS	1985	Department of Statistics/ CDC	B.N. Shrydeh	Husbands of women in 1983 survey	3,000[a]		Field work planned
Lebanon (South Lebanon and West Bekaa)	390	CPS	1983–84	Lebanon Family Planning Association(LFPA)/WPAS	T. Osseiran	Currently married age 15–49	1,445	(To be conducted where LFPA is implementing a household distribution program)	Final report completed
Morocco	43–46	WFS	1979–80	Ministère de la Santé Publique/WFS	A. Alaoui	All women age 15–50	5,800	FP, fertility regulation, general mortality, public health	Final country report completed**
Morocco (3 provinces)	402	CPS	1981–82	Ministère de la Santé Publique/WPAS	T. Alaoui M. Ouakrim	Ever-married age 15–49	3,062	Supplementary study to evaluate integrated MCH/ FP program	Final report completed
Morocco	401	CPS	1983–84	Ministère de la Santé Publique/WPAS	T. Alaoui M. Ouakrim	Ever-married age 15–49	6,222	Supplementary study to evaluate integrated MCH/ FP program	Final report in progress**
Syria	62, 63	WFS	1978	Central Bureau of Statistics/Center for Population Surveys and Research/WFS	A.M. Al-Akhras	Ever-married under age 50	4,487	Community-level (in part), economic (in part), general mortality, FOTCAF	First country report completed**
Tunisia	68, 69	WFS	1978	Office National de la Famille et de la Population/ WFS	R. Dekhili	Ever-married age 15–49	4,123	FP (in part), abortion, FOTCAF	First country report completed**
Tunisia (Jendouba)	370	CPS	1979	Office National de la Famille et de la Population/ WPAS	R. Dekhili A. Sellami	All women age 15–49	2,443	Supplementary study to evaluate household distribution program	Final report completed
Tunisia	371	CPS	1983	Office National de la Famille et de la Population/ WPAS	R. Dekhili H. Chekir	Ever-married age 15–49	2,260	Questions on utilization of private-sector sources for contraceptive services, child health, and breast-feeding	Final report in progress**
Turkey	70, 71	WFS	1978	Hacettepe University/WFS	E. Tunçbilek	Ever-married age 15–49	4,431	FP, economic, abortion (in part), fertility regulation (modified), response error	First country report completed
Yemen Arab Republic	74, 75	WFS	1979	Central Planning Organization/WFS	Y. El-Kaizal	Ever-married under age 51	2,605	General mortality, FOTCAF	Final country report completed**

** = Survey data included in other tables in this report
NA = Not available

BEMFAM Sociedade Civil de Bem-Estar Familiar no Brasil
CBD Evaluation of community-based distribution program
CDC US Centers for Disease Control
CONAPOFA Consejo Nacional de Población y Familia
CPS Contraceptive Prevalence Survey
FHI Family Health International
FOTCAF Factors other than contraception affecting fertility
FP Family planning
FP/MCH Family Planning/Maternal-Child Health
IEC Information, education, and communication
IPPF International Planned Parenthood Federation
MCH Maternal and child health
MOH Ministry of Health
TYA Teenage-Young Adult Family Planning Survey
UNFPA United Nations Fund for Population Activities
WFS World Fertility Survey
WPAS Westinghouse Public Applied Systems

[a]Number of women expected to be interviewed
[b]Associate status
[c]Census of population in 1976; information on knowledge, attitude, and practice of family planning in 1977 included in appendix
[d]Excludes students
[e]Women age 15–19 included if ever-married or ever gave birth

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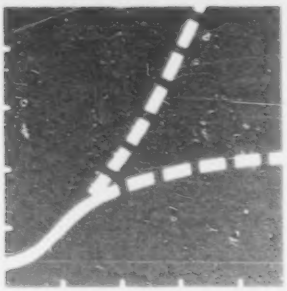

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SPECIAL TOPICS

Population Information Program, The Johns Hopkins University, Hampton House, 624 North Broadway, Baltimore, Maryland 21205, USA

Youth in the 1980s: Social and Health Concerns

Editors' Summary. More than one billion of the nearly five billion people in the world today are between the ages of 10 and 19. To highlight the challenges and opportunities that face young people, the United Nations designated 1985 International Youth Year. National and international agencies are focusing new attention on the problems of youth and on programs to help young people make the transition to responsible adulthood.

The major challenges that young people today face are:

- **Education.** While secondary school enrollment is increasing, in Asia less than half of school-age children continue beyond primary school, and in Africa, less than one-quarter. Without education young people are handicapped in finding jobs and even in taking care of their own families. Far fewer girls go to secondary school than boys.
- **Employment.** Young people often have trouble finding jobs. Unemployment among those under age 20 is 2 to 10 times as high as among older workers.
- **Marriage.** The age at which women marry is increasing in much of the world. This means more time for education, more time to learn job skills, and more time to mature physically and socially before starting families. But it also means more uncertainty about the future, and, for some girls, more risk of an unwanted pregnancy in the 5 to 10 years before marriage.
- **Reproductive health.** Early sexual activity, which may be increasing in some countries, can expose young people to:
  - —sexually transmitted diseases,
  - —unwanted pregnancy,
  - —life-threatening complications and risks from pregnancy and childbirth—more common in very young mothers,
  - —more infant sickness and deaths, and
  - —social and economic handicaps for young parents and their children.

Young people also are increasingly exposed to drinking, smoking, drug use, and other activities, seemingly grown-up and sophisticated, but often disastrous.

Preventing Youth Problems

Parents, schools, churches, health organizations, social agencies, family planning associations, and other service programs are developing new approaches to help young people face these challenges. Educational programs have been designed to help parents talk to their own children about growing up; to introduce family life and responsible parenthood into the school curriculum; and to reach out-of-school youth at home and at work. Health and social service centers provide information and guidance through individual and group counseling sessions, peer group meetings, and telephone hot lines. Even the mass media, which produce many materials designed to be sexually stimulating, are now beginning to carry messages urging restraint and self-discipline and to provide information about avoiding pregnancy.

These efforts all pursue the same ultimate goal of helping young people achieve everything they can in education, employment, health, and family life. In the words of the slogans used in Jamaica, "Before you be a mother, be a woman" and "Before you be a father, be a man." **End of Editors' Summary.**

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SOCIAL AND ECONOMIC BACKGROUND

1985 was International Youth Year—a year for recognizing the importance of youth and the problems they face, a year for seeking solutions to these problems. Youth has been variously defined (323, 700, 772), but, however defined, many youths today face a new situation. In traditional societies young people passed rapidly from childhood to adulthood. Girls married shortly after reaching puberty, and boys worked as adults long before they reached age 20. Now, as education takes longer and becomes more necessary for jobs, as moving to the city becomes more important to making a living, and as marriage comes later in life, young people are facing a longer period of preparation for adult responsibilities. While this long transition brings new opportunities and new challenges for young people, it also creates a difficult task for societies in meeting the socioeconomic and health needs of these young people.

Today one in every five people in the world is between the ages of 10 and 19—just over one billion people. In the last 15 years, from 1970 to 1985, the number of young people increased by about one-third, from 766 million to 1.03 billion. In the next 15 years, from 1985 to 2000, their numbers will increase to 1.12 billion (see Table 1). The fastest growth will occur in sub-Saharan Africa and South Asia (see Figure 1).

In developing countries one of every four persons is between ages 10 and 19—a total of 860 million young people. The large number of young people in developing countries today is a result of high fertility in the past. There were so many couples of childbearing age in the late 1960s and early 1970s that, even though these couples averaged fewer children than their parents, the number of 10 to 19 year olds increased overall about 10 percent faster than the rest of the population. By comparison, in the developed countries only one person in seven is between the ages of 10 and 19. This age group is not expected to grow in developed countries over the next 15 years, while the population of all ages may increase by 9 percent (see Table 1).

These population figures mean that worldwide approximately one person in every five needs education and training, one in every five will need to start work or to find some form of family support, one in every five needs health care to meet the special needs of this period of rapid physical and emotional development. One in every five is making the transition from depending on parents and society to contributing to society and starting families of his or her own. The acute shortage of teachers, schools, health services, and jobs makes this crucial transition even more difficult for young people today.

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Phyllis T. Piotrow, Ph.D., Director, Population Information Program; Walter W. Stender, Associate Director; Ward Rinehart, Editor and Associate Director.

Table 1. Estimated Populations for 1970 and Projected Populations for 1985 and 2000 at All Ages and Ages 10–19, for World Regions

Region & Country	Population (in Millions)						% Increase 1970–1985		% Increase 1985–2000	
	1970		1985		2000					
	All Ages	10–19	All Ages	10–19	All Ages	10–19	All Ages	10–19	All Ages	10–19
World total	3,683	776	4,842	1,031	6,127	1,125	31	33	27	9
Developed regions	1,047	186	1,173	177	1,276	177	12	−5	9	*
Developing regions	2,636	591	3,699	858	4,851	949	40	45	32	11
Africa	274	60	428	97	692	161	56	61	62	66
Asia	2,022	447	2,711	633	3,375	607	34	42	25	−4
Latin America & Caribbean	284	64	406	90	550	114	43	39	35	27
Middle East & North Africa	157	35	238	53	354	80	52	51	59	51
Oceania	19	4	25	5	30	5	28	21	23	12
North America	226	44	263	38	297	43	16	−13	13	10
Europe	459	74	442	74	513	67	−4	*	4	10

*Less than one-half of one percent

Source: Medium variant from: United Nations. World population prospects: estimates and projections as assessed in 1982. (1986)

Education

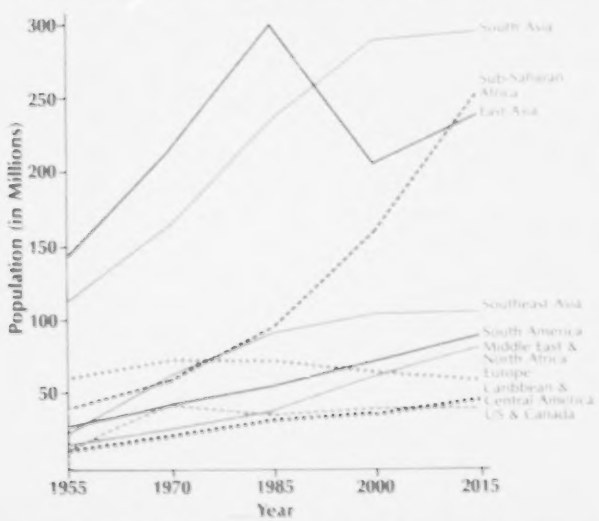
Developed and now also developing countries are emphasizing formal education—at least to achieve basic literacy. Although most developing countries are committed to expanding and improving education, many cannot keep pace with the rapid growth of the school-age population. In a number of developing countries the total number of students enrolled in all educational institutions has increased considerably over the last two decades (689). At the secondary level, enrollment between 1970 and 1980 has grown substantially in many countries (see Table 2). Because of rapid population growth, however, the numbers who remain illiterate or without adequate schooling have increased even more rapidly (689). And everywhere the aspirations of young people and their parents for more education have risen and are not being fully met.

School enrollment rates and other indicators of educational efforts reflect the varied levels of commitment that individuals and governments are able to make (see Table 2). Enrollment rates at the secondary level vary among regions but in developing countries seldom surpass 60 percent. Reported rates are lowest in Brazil, Nepal, and Africa. Among six African countries with data, no more than one-quarter of males are enrolled in secondary school, and no more than 16 percent of females. While secondary school enrollments have grown substantially, in 8 of the 11 developing countries where comparisons can be made the increase in the number of students between 1970 and 1980 outpaced the increase in the number of teachers (see Table 2).

Fewer girls than boys are being educated at the secondary level, and the discrepancy is even greater at the post-secondary level, where much professional and vocational training takes place. The difference is greatest in Africa, where, at the secondary level in most countries with available data, female enrollment rates run about one-half of male rates. In other developing regions the picture is mixed: in some countries, such as Malaysia, the Philippines, and Chile, girls are as likely to be in secondary school as boys, but in others fewer girls are obtaining education (see Table 2). Girls' enrollment rates have been catching up with boys' over the last two decades, however (242). Women's education has implications for their health and fertility, since better educated women are more likely to marry and begin childbearing later, when health problems are less likely (see p. M-365). Educated women also are more likely to use contraception, to have fewer children, and to take better care of the children they have (242, 423).

Government expenditures on education currently range from about 10 to 25 percent of all public expenditures (703, 753, 824). With the increases in the youth population expected by the year 2000 (see Table 1), many developing countries may find it difficult to increase spending on education fast enough to build more schools, raise enrollment rates, and provide better education for all those in school.

Figure 1. Population Age 10–19, by Region, 1955–2015



Source: medium variant from United Nations, World population prospects: estimates and projections as assessed in 1982. (696)

The world's population of 10 to 19 year olds grew by 33 percent in the past 15 years and is expected to grow nearly 10 percent in the next 15 years. The fastest growth is expected in South Asia and sub-Saharan Africa, with little change in Europe or North America.

Table 2. Secondary School Enrollments, 1979–1982, and Increase in Numbers of Teachers and Students, Selected Countries, 1970–1980

Region, Country & Year	% Enrolled		% Increase in Numbers at Secondary Level, 1970–80	
	Male	Female	Teachers	Students
AFRICA				
Kenya 1981	24	16	159	217
Mozambique 1981	6	3	10	140
Senegal 1981	16	8	NA	-61
Somalia 1980	9[a]	4[a]	104	76
Sudan 1981	20	15	135	190
Zambia 1982	21	12	NA	NA
ASIA & PACIFIC				
China 1980	49	32	NA	114
India 1982	44	24	NA	NA
Indonesia 1982	39	28	105	133
Malaysia 1981	54	51	NA	NA
Nepal 1980	33	9	NA	NA
Philippines 1981	42[b]	46[b]	65	70
Thailand 1980	30	28	NA	175
LATIN AMERICA & CARIBBEAN				
Brazil 1978	29	35	—41[b]	—38[b]
Chile 1983	62	68	NA	78
Colombia 1981	45[a]	51[a]	102	152
Jamaica 1980	53	59	NA	238
Mexico 1981	54	49	145	199
MIDDLE EAST & NORTH AFRICA				
Egypt 1981	67	45	110	102
Morocco 1982	34	22	154	169
Tunisia 1982	35[a]	22[a]	108	53
DEVELOPED COUNTRIES				
France 1979	75[a]	82[a]	—5	17
United States 1982	92		7[b]	—27

Note: Exact comparisons among enrollment rates are not possible because official school age for secondary and post-secondary education varies.

NA = not available

[a]Net rates, which include only those of official school age. Others are gross rates, which may be inflated by the presence in school of some pupils below or above the official secondary-school age.

[b]1970–78

Source: Grant & Snyder (250); UNESCO (833); UNESCO (703); World Bank (753)

Employment

Throughout the world, young people face more problems finding work than older men and women. In the developing countries, where a high percentage of the population is young, many youths enter the labor force each year. As a result, in developing countries today 18 to 23 percent of the labor force is under age 19, compared with 3 to 8 percent in developed countries (320).

For workers of all ages, there are not enough jobs to go around, and the problem is getting worse. In the 1970s the labor force in the developing countries grew at 4 to 7 percent per year, mostly through the influx of young people looking for work for the first time. During the same period, however, in the cities, where many young people go to look for work, employment opportunities grew at only 2.5 percent per year (679). In Swaziland, for example, about 3,000 new jobs are created each year, but over 7,000 people enter the job market annually (810).

As a result, the number of unemployed of all ages has risen dramatically in the past decade. In India, for example, the number of unemployed rose from 8 million in 1973 to 19 million in 1982. The number of unemployed males increased by 100 percent, while the number of unemployed females increased by 176 percent (320).

All over the world data on unemployment among young people show the same pattern: many youths looking for work, and many unable to find it. Whatever the unemployment rate among the labor force as a whole, the rate among those age 15–19 is at least twice as high, and in some cases as much as 10 times as high (see Table 3). Thus young people constitute a large percentage of the unemployed in many countries—for example, in the early 1980s, 20 percent of the unemployed in India and the US were under age 19; in Jamaica and Hong Kong, 26 percent of the unemployed were under 19; in Thailand, 27 percent; in South Korea and Ghana, 36 percent; and in the Philippines, 38 percent (320).

For young people without previous work experience, the problems of inadequate education and unemployment are closely tied. Chances of finding employment are improved by more schooling (7). Increasingly, however, the well-educated also are having difficulty finding work when they finish higher education (464). Some young people, discouraged by the lack of better jobs even for the educated, see no point in staying in school. And, of course, if young people and their parents or other relatives cannot pay for more schooling or cannot manage without the young person's earnings, the young people have little choice but to look for work.

Table 3. Unemployment Rates, by Sex, at Age 15–19 and All Ages, Selected Countries, 1980–1982

Region, Country & Year	Sex	Ages 15–19 Number Unemployed	Ages 15–19 Percent Unemployed	All Ages Percent Unemployed
ASIA & PACIFIC				
Hong Kong	M	14,400	13.3	4.3
1982	F	10,500	10.8	4.1
Korea, Rep. of	M	68,000	14.5	5.9
1982	F	133,000	26.9	2.5
LATIN AMERICA & CARIBBEAN				
Chile	M	52,700	23.2	11.9
1981	F	15,900	19.6	9.9
Colombia	M	53,540[a]	7.9[a]	2.6
1980	F	54,340[a]	12.9[a]	7.2
Costa Rica	M	19,330	20.7	8.7
1982	F	8,580	24.7	11.4
Jamaica	M	29,300	40.1	14.1
1981	F	47,800	81.7	38.6
Venezuela	M	69,640	17.7	7.8
1982	F	12,230	10.9	5.2
DEVELOPED COUNTRIES				
Germany, West	M	96,900	7.6	5.6
1982	F	97,900	9.6	7.7
Great Britain	M	336,129[b]	24.7[b]	13.5
1984	F	250,748[b]	20.6[b]	8.5
Japan	M	50,000	6.5	2.4
1982	F	30,000	4.3	2.1
United States	M	1,812,000[b]	19.6[b]	7.4
1984	F	687,000[b]	18.0[b]	7.6

[a]Less than age 19
[b]Age 16–19
[c]Age 16 and above

Source: International Labor Office (320), except Great Britain: Great Britain (251), and US: Howe (303).

Migration

Many young people migrate to the cities in search of better jobs (416, 679) (see **Population Reports**, *Migration, Population Growth, and Development*, M-7, September-October 1983). The large number of youths among migrants and their impact on urban populations is illustrated by a recent study of 26 cities in developing countries. For example, in the city of Algiers between 1960 and 1970, migration accounted for 91 percent of the growth in the male population age 15–29 and 71 percent of the growth in the female population age 15–29. In Buenos Aires, migration accounted for 89 percent of the growth in the female population and 81 percent of the growth in the male population age 15–29 (698). In a study covering 40 villages in North India, 60 percent of individual adult migrants were between the ages of 15 and 21 (416). In South Korea between 1961 and 1975, 31 percent of rural-to-urban migrants were age 10–19, and 30 percent were 20–29 (819).

For the young, migration means suddenly entering a challenging new environment for which they often are unprepared. Even though many migrants join family members who have preceded them to the cities, the young migrants are exposed for the first time to a broader range of attitudes and behavior; the traditional rural consensus supporting narrowly prescribed norms of behavior may be missing; and the care and assistance of the family and community may be diminished.

Thus young migrants often find themselves lacking the guidance that they need in the face of difficult and important choices. Some may experience the health and social risks of early sexual intercourse—sexually transmitted diseases, unwanted pregnancy, or illegal abortion. In the extreme, they may stumble into crime, alcoholism, or drug addiction (455).

In some instances economic hardships force migrant parents—and other parents—to abandon their children, who then must steal or beg on the street to survive. It is estimated that there are 20 million abandoned children in Asia, 10 million in Africa and the Middle East, and 30 to 40 million in Latin America (312, 645, 831).

"The wanted child will never be abandoned," says this Brazilian poster. Abandoned children throng the streets of some cities. Many are children of young mothers who cannot care for them.

The problems of too little education, too few jobs, and often a new and complex environment combine to handicap youth at the very start of the path through adult life. In addition, many at this age marry, begin sexual activity, and become parents. There are considerable risks in starting on this adult course too soon, when youths may be physically, emotionally, or economically unprepared. While most young people will make this transition and may indeed find new opportunities that were not open to their parents, others will face difficult problems that may be avoided with more adult or community guidance.

AGE AT MARRIAGE AND EARLY FERTILITY

Whatever their education or employment, most young people are concerned about marriage and family. The decisions they make—who they marry, how old they will be when they marry, how many children they will have and when, whether to use family planning methods—will greatly influence their own lives and their children's lives. In many countries people are marrying later to allow time for more education or to be sure of an income before marriage. As a result, in developing countries fertility among young people has declined over the last 20 years, even though most young married couples do not use family planning until they have at least one child.

Marriage Patterns

Around the world, women marry for the first time at different ages. In developed countries, East Asia, and a few Latin American countries, two-thirds or more of women do not marry until after age 20. In contrast, in Indonesia, Bangladesh, Pakistan, and many African and Caribbean countries, the majority of women marry before age 20 (see Table 4). (In Latin America and the Caribbean, marriages may be civil marriages, religious marriages, or consensual unions not sanctioned by state or church.) In all regions women from urban areas and women with schooling tend to marry later—sometimes much later—than women in rural areas and women who have not been to school. The trend toward later marriages is seen in Asia, the Middle East, and parts of Africa.

In developed countries most women marry for the first time in their early to mid-20s. In Japan the singulate mean age at marriage (that is, the average age at first marriage among all women who marry) is 24 (404); in northern Europe, it ranges from 24.2 in Finland to 27.1 in Sweden (221, 505, 667). In the 1982 US Survey of Marriage and Family Growth, only one-quarter of women age 20–24 had married before age 20 (50).

In Asia almost all women marry, but age at marriage varies widely throughout the region. Singulate mean age at marriage ranges from a low of 16 in Bangladesh to a high of 25 in Sri Lanka (see Table 4). In most Asian countries the trend is toward later marriage. The greatest change has occurred in South Korea. Among women age 40–44 at the time of the 1974 World Fertility Survey (WFS), 70 percent had married before age 20. Among younger women, age 20–24, however, only 15 percent had married before age 20 (390). Similar but less dramatic changes have been recorded in China (117), Indonesia, Sri Lanka, peninsular Malaysia, and the Philippines (see Table 4).

In Latin America and the Caribbean and in the Middle East and North Africa, women now tend to marry in their early 20s. In Latin America and the Caribbean this pattern has persisted for some time, with formal marriage or consensual union sometimes following the birth of a child rather than preceding it. In the Middle East and North Africa, in contrast, age at marriage was much lower a few decades ago and has risen only recently.

In Africa most women still marry young. In the 11 countries with Contraceptive Prevalence Survey (CPS) or World Fertility Survey (WFS) data, two-thirds or more of all women age 20–24 married before age 20. In Islamic countries, especially the Sahel states of Mali, Chad, Niger, and Mauritania, young women have traditionally married shortly after menarche, when menstruation begins (290). This pattern is changing, however, and age at marriage is increasing in a number of Islamic areas—northern Sudan, Senegal, and Mauritania (see Table 4). In contrast, in several other countries—Benin, Botswana, Cameroon, and the Ivory Coast—women seem to be marrying earlier, although errors in reporting among older women might explain the apparent increase (see **Population Reports**, *Fertility and Family Planning Surveys: An Update*, M-8, September-October 1985).

In almost all developing countries young women in rural areas marry earlier than women in cities (172, 423, 448). In most countries rural women marry 1½ to 2 years earlier

than urban women (448). Urban women are more likely to go to school and to work outside the home. This may help to account for later marriage.

In all regions men marry later than women, or, to put it another way, men tend to be three to four years older than their wives (172, 697). In most areas men marry, on average, in their mid-20s (172, 356). In a few Asian and African countries—Central African Republic, Chad, Nepal, Turkey, and Yemen Arab Republic—men marry earlier, before age 24. Later average age at marriage, 27 or older, is reported in Egypt, Japan, Norway, Sri Lanka, Sweden, and Tunisia (172, 356, 404, 505, 667).

Table 4. Singulate Mean Age at First Marriage for Women and Percentage Married Before Age 20 Among All Women Age 20–24 and Age 40–44, Selected Countries, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1983

Region, Country & Year	Singulate Mean Age at Marriage	% Married Before Age 20 by Age When Surveyed	
		20–24	40–44
AFRICA			
Cameroon 1978	17.5	81	73
Ghana 1979–80	19.3	72	68
Ivory Coast 1980–81	17.8	80	71
Kenya 1977–78	19.9	65	73
Nigeria 1981–82	18.5	76	70
Senegal 1978	17.7	77	88
Sudan (north) 1978–79	21.3	57	76
ASIA & PACIFIC			
Bangladesh 1975–76	16.3	94	98
Indonesia (Java & Bali) 1976	19.4	71	87
Korea, Rep. of 1974	23.2	15	70
Pakistan 1975	19.8	69	88
Philippines 1978	24.5	30	49
Sri Lanka 1975	25.1	27	57
LATIN AMERICA & CARIBBEAN			
Brazil			
Northeast region 1980	22.2	36	33
Piaui 1982	21.1	35	35
Southern region 1981	21.7	41	39
Colombia 1980	NA	34	44
Costa Rica 1980	NA	39	44
Dominican Republic 1983	NA	54	64
Guatemala 1983	19.9	59	55
Haiti 1977	21.8	48	56
Jamaica 1983*	16.8	83	83
Mexico 1979	NA	50	56
Peru 1981	NA	42	47
Venezuela 1977	21.8	45	59
MIDDLE EAST & NORTH AFRICA			
Egypt 1980	21.3	54	76
Jordan 1983	23.8	26	45
Morocco 1979–80	21.3	53	85
Syria 1978	22.1	50	56
Tunisia 1978	23.9	29	59
Yemen Arab Rep. 1979	16.9	84	76

Note: Singulate mean age at marriage measures the average age at first marriage among women eventually marrying.

NA = not available

*Includes all visiting unions

Source: London et al., *Fertility and family planning surveys—an update*, **Population Reports** M-8, September–October 1985.

The average age at first marriage among men may be rising, as it is among women. In Scandinavian countries, for example, men are marrying one to two years later than their fathers (221, 505, 667). Longer education, migration, and the greater difficulty of supporting a family in a non-agricultural economy may account for the increase.

Fertility Patterns

In most countries fertility patterns among young women reflect age at marriage since most births occur within marriage (see Figure 2). Indeed, one of the major purposes of marriage is to have children, and, conversely, pregnancy or childbearing is often the reason for marriage. In countries where women marry young, such as Bangladesh, fertility rates among women age 15–19 are high—over 200 per 1,000 women in the age group (see Table 5). Where age at marriage is high, as in developed countries, the Middle East, and East Asia, fertility rates among women age 15–19 are low. The lowest fertility rate today among women age 15–19 is found in Japan, at 3.9 per 1,000 women age 15–19

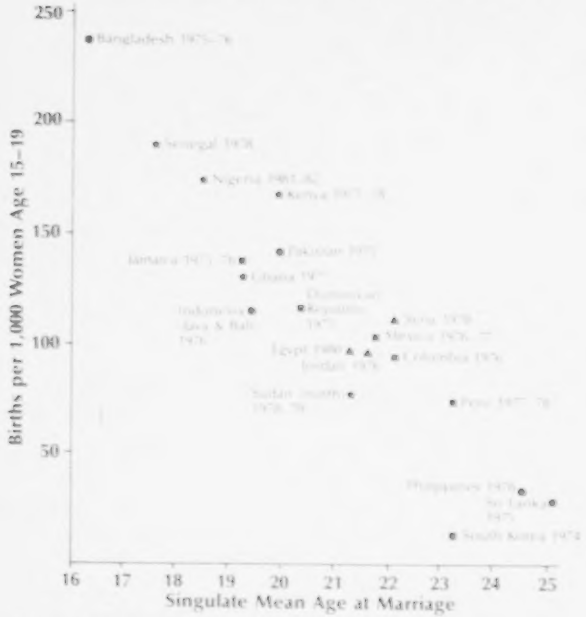
Table 5. Fertility Rates Among Women Age 15–19 and 20–24 and Percentage of Women Giving Birth Before Age 20 Among Women Age 20–24 and 40–44, Selected Countries, World Fertility Survey, 1974–1983

Region, Country & Year	Births per 1,000 Women Per Year At Age:			% Women Giving Birth Before Age 20 by Age When Surveyed	
	15–19	20–24	15–49	20–24	40–44
AFRICA					
Ghana 1977	136	255	NA	56	48
Kenya 1977–78	168	342	NA	63	54
Lesotho 1977	76	280	NA	NA	NA
Nigeria 1981–82	173	284	NA	NA	NA
Senegal 1978	189	304	NA	NA	NA
Sudan (north) 1978–79	77	314	NA	NA	NA
ASIA & PACIFIC					
Bangladesh 1975–76	237	302	205	80	76
Fiji 1974	59	228	127	29	49
Indonesia (Java & Bali) 1976	115	228	132	51	55
Korea, Rep. of 1974	14	190	120	6	33
Malaysia 1974	53	214	131	25	52
Nepal 1976	120	282	188	47	40
Pakistan 1975	141	271	183	49	64
Philippines 1978	35	192	138	22	36
Sri Lanka 1975	31	139	103	18	41
Thailand 1975	62	199	125	26	31
LATIN AMERICA & CARIBBEAN					
Colombia 1976	96	215	139	37	37
Dominican Rep. 1975	116	270	170	44	54
Guyana 1975	100	253	143	39	56
Jamaica 1975–76	137	234	144	57	44
Mexico 1976–77	104	276	174	41	46
Peru 1977–78	74	220	152	23	38
MIDDLE EAST & NORTH AFRICA					
Egypt 1980	99	256	NA	NA	NA
Jordan 1976	97	327	210	44	54
Syria 1978	112	298	NA	NA	NA

NA = not available

Sources: Casterline & Trussell (97); Ghana (237); Hanenberg (271); Kenya (369, 370); World Fertility Survey (758, 759, 761, 762, 763).

Figure 2. Singulate Mean Age at Marriage and Age-Specific Fertility Rate for Women Age 15–19, Selected World Fertility Survey Data, 1974–1982



Source: Tables 4 and 5.

In Bangladesh and Senegal, where women marry young, fertility at ages 15–19 is high; where women marry late, as in Sri Lanka, the Philippines, and South Korea, fertility at ages 15–19 is low.

(695). The 1983 US rate was 52 births per 1,000 women age 15–19, but o half of these births were to unmarried women (720).

In the developing world a few countries—South Korea, Malaysia, the Philippines, and Sri Lanka, where age at marriage is usually over 20—report fairly low fertility rates among women age 15–19, ranging from 14 to 53 births per 1,000 women. In most countries, however, high fertility rates among the young are the rule (see Table 5). In Africa, for example, fertility rates in Nigeria and Senegal are 173 and 189 per 1,000 women age 15–19. In the Asian countries where early marriage is still common, fertility rates at age 15–19 are usually over 100 per 1,000 women. Latin American and Caribbean countries show more moderate fertility rates—from 74 in Peru to 137 in Jamaica—although these rates are still high compared with those in developed countries.

Fertility rates among young women have declined in many countries, especially where mean age at marriage has increased. Vital statistics show dramatic declines in fertility rates among the young between the 1960s and the 1970s or early 1980s in South Korea, Malaysia, Sri Lanka, Tunisia, Cuba, and Cameroon (290, 694, 695). In China births to women age 15–19 accounted for 7 percent of all births in 1955 but only 2 percent in 1980, at a time when older women also were having few children (117). More moderate declines occurred in most countries of Latin America and northern and western Europe and in the US (743).

An indication of declining fertility among young women is the drop in the percentage of women who give birth before age 20. In most countries women now age 20–24 are less likely to have had an early birth than women now age 40–44 (see Table 5). The proportion of young women giving birth during adolescence appears to have increased, however, in at least six countries with survey data—Bangladesh, Ghana, Jamaica, Kenya, Nepal, and Syria. These are countries where there has been little or no increase in the age at marriage.

Contraceptive Use Among Young Married Couples

In much of the developing world contraceptive use is low among married women age 15–19. Except in Latin America, few young women use contraception between marriage and first pregnancy. Thus in most countries at least 70 percent of women who marry young have at least one child before age 20. After giving birth to one child, however, some women begin using contraception to space their next births. In 15 of 23 countries with available WFS data, contraceptive use was markedly higher among young women with one living child than among those with no children (see Table 6). In general, the percentage of married women age 15–19 using contraception is about half as high as the percentage for all married women of reproductive age (see Table 7).

In contrast to the developing countries, in the US and Europe contraceptive use among young married couples is

Table 6. Contraceptive Use Among Exposed[a] Women Age Less than 20 and 20–24, with No Living Children or with One Living Child, Selected Countries, World Fertility Survey, 1974–1980

Region, Country & Year (Ref. No.)	Current Age <20		Current Age 20–24	
	No Living Children	One Living Child	No Living Children	One Living Child
AFRICA				
Cameroon 1978 (94)	3[b]	19[b]	2	4
Ghana 1979–80 (238)	5	6	15	10
Kenya 1977–78 (370)	0	4	1	5
Lesotho 1977 (408)	1	3	1	3
ASIA & PACIFIC				
Bangladesh 1975–76 (56)	3[b]	6[b]	5	8
Malaysia 1974 (432)	8[b]	28[b]	11	41
Nepal 1976 (498)	0	0	0	1
Pakistan 1975 (522)	0[b]	0[b]	0	2
Philippines 1978 (548)	6	26	8	37
Sri Lanka 1975 (656)	5[b]	24[b]	5	21
Thailand 1975 (124)	8[b]	29[b]	11	41
LATIN AMERICA & CARIBBEAN				
Guyana 1975 (260)	25[b]	24[b]	30	31
Jamaica 1975–76 (342)	34	35	42	39
Mexico 1976–77 (467)	7[b]	27[b]	16	45
Peru 1977–78 (546)	17[b]	19[b]	14	41
Trinidad & Tobago 1977 (683)	57	45	60	58
MIDDLE EAST & NORTH AFRICA				
Egypt 1980 (179)	0	12	5	20
Jordan 1976 (354)	2	19	6	31
Morocco 1979–80 (481)	7	18	5	20
Syria 1978 (668)	2	18	9	24
Tunisia 1978 (686)	1	18	4	27
Turkey 1978 (267)	8	33	8	49
Yemen Arab Rep. 1979 (788)	0	0	0	1

[a]Exposed women include those who are currently married or in union, not pregnant, and fecund ("physically able to have a child").
[b]Age 15–19.
[c]Fewer than 50 cases.

quite common, and often usage levels are similar to those among all married women of reproductive age (see Table 7). On one hand, pressures to have a child immediately are weaker. Parents and friends may encourage the young couple to finish school or encourage a young woman to keep working until she and her husband can better afford a child. On the other hand, as in developing countries, early marriage may be the result of unplanned pregnancy. In that case, young married couples in developed countries often use contraception immediately after the first birth to delay a second birth until they are ready for more children.

Fertility Consequences of Early Marriage

Regardless of contraceptive use, women who marry or enter into a consensual union at an early age tend to have larger families than women who marry later. Even delaying marriage for one or two years can make a difference in completed family size. In 27 of 29 countries surveyed through WFS, women who had married at age 22 or later averaged 0.5 fewer children than those who had married at age 18 or 19. The association between age at marriage and completed family size remained even after differences in contraceptive use were taken into account (413). Differences in family size by age at marriage are particularly marked in Latin America (451).

Women who marry young have larger families because they are exposed to the risk of pregnancy longer than women who marry later. Also, women are very fecund between the ages of 18 and 24, and coital frequency is likely to be high. At the same time, women who marry young tend to use contraception less. All of these factors are associated with having large families (22, 448, 451).

Early marriage also increases population growth by shortening the time between generations, thus increasing the

Table 7. Contraceptive Use Among Currently Married Women Age 15–19, 20–24, and 15–44, Contraceptive Prevalence Surveys and World Fertility Survey, 1974–1984

Region, Country & Year	% Using Any Method, by Age		
	15–19	20–24	15–44
AFRICA			
Benin 1981–82	12	19	20
Cameroon 1978	2	3	3
Ghana 1979–80	5	8	10
Ivory Coast 1980–81	2	4	8
Kenya 1977–78	2	6	7
Nigeria 1981–82	4	6	5
Senegal 1978	3	3	4
Senegal	0	1	1
Sine Saloum (rural) 1982			
Somalia (urban) 1983			
Baydhaba	0	0	1
Hargeisa	4	7	3
Kismayu	0	1	0
Mogadishu	0	1	1
Sudan (north) 1978–79	4	4	5
Zaire (urban) 1982–84			
Kangana	10	11	12
Kinshasa	39	40	36
Kisangani	19	17	19
Lubumbasi	34	36	37
Zimbabwe 1984	25	44	40
ASIA & PACIFIC			
Bangladesh 1979–80	6	11	13
Fiji 1974	21	32	42
Indonesia (Java & Bali) 1976	13	27	28
Indonesia (urban) 1983			
Jakarta	21	35	44
Medan	11	22	36
Semarang	38	48	54
Surabaya	18	37	47
Ujung	8	26	33
Korea, Rep. of 1979	11	19	55
Nepal 1981	0	3	7
Philippines 1978	16	29	39
Sri Lanka 1982	28	41	57
Thailand 1981	29	48	59

Region, Country & Year	% Using Any Method, by Age		
	15–19	20–24	15–44
LATIN AMERICA & CARIBBEAN			
Barbados 1980–81	28	45	47
Bolivia 1983	13	24	26
Brazil			
Amazonas (urban) 1982	21	41	53
Northwest region 1980	18	30	37
Piaui 1982	15	24	35
São Paulo 1978	43	61	66
Southern region 1981	45	65	66
Costa Rica 1981	47	58	66
Dominican Republic 1983	19	36	47
Ecuador 1979	14	29	35
El Salvador 1978	8	33	34
Guatemala 1983	9	16	25
Haiti 1983	4	5	7
Honduras 1981	8	23	27
Jamaica 1983	34	49	52
Mexico 1979	20	38	40
Panama 1979–80	29	49	61
Paraguay 1979	19	36	39
Peru 1981	22	38	43
Venezuela 1977	29	45	49
MIDDLE EAST & NORTH AFRICA			
Egypt 1980	4	13	25
Jordan 1983	4	17	26
Morocco 1983–84	11	22	27
Syria 1978	9	15	20
Tunisia 1983	19	30	42
DEVELOPED COUNTRIES			
Great Britain 1976	87[a]	92	86[b]
Italy 1979[c]	70	83	84
Netherlands 1982[d]	90[e]	88[f]	78[g]
Norway 1977[h]	87[i]	84	84
United States 1982	53	59	68

[a]Age 16–19
[b]Age 16–49
[c]Based on all women exposed to the risk of conception
[d]Based on currently married or cohabiting women age 18–37
[e]Age 18–22
[f]Age 23–27
[g]Age 18–37
[h]Based on all nonpregnant fecund women who had had sexual intercourse during the four weeks before the interview
[i]Age 18–19
[j]Age 18–44

Source: developing countries from London et al. (423); developed countries—Great Britain: Dunnell (170); Italy: DeSandre (155); Netherlands: Van de Giessen (724); Norway: Ostby (521); United States: Mosher (486).

total number of children born in a given time span. If women and their daughters marry at age 15, the average span between generations could be shorter than 20 years. In contrast, if women marry at age 25, the span between generations could be as large as 30 years. The implications of this difference for population growth are considerable (see **Population Reports**, *Age at Marriage and Fertility*, M-4, November 1979).

In summary, the chief demographic limit on early fertility is age at marriage. When women marry later, there are fewer early births. In developing countries contraceptive use does not play a major part in reducing fertility in the early reproductive years, even though increasing evidence suggests that later childbearing and more space between births for young mothers would have important health benefits (see p. M-365). But later marriage increases the interval between menarche and marriage, and other problems arise.

BETWEEN MENARCHE AND MARRIAGE

As young men and women struggle to acquire more education, as they move to cities to find jobs, and as age at marriage increases, the time that girls spend between menarche and marriage is extended. Where once childhood ended abruptly with marriage, now an intermediate period, past childhood but not yet adulthood, often intervenes for both boys and girls. Whether these young people are called teenagers, adolescents, or youth, they face new problems because they reach sexual maturity before they have reached physical, emotional, social, or economic maturity. For boys, sexual desires grow strong before they are ready or able to support a family. For girls, opportunities to go to school, to hold a job, or to find a suitable husband may be jeopardized by sexual activity at an early age, leading perhaps to an unwanted pregnancy, sexually transmitted disease (STD), or infertility. Both boys and girls need information and guidance to help them through this difficult period, but their access to such help is often limited.

Premarital Sexual Activity

Sexual abstinence offers the only complete protection for young people against STDs and unwanted pregnancy. When men and women marry later, however, they are more likely to be sexually active before marriage. While data are limited, particularly in developing countries, reports suggest that premarital sexual activity is not only common in some areas, but also increasing. More young men and women are sexually active, and they are beginning sexual activity younger (161, 241, 264, 298, 391, 610, 778, 779, 798, 813). For both sexes, but especially for the young woman who risks an unwanted pregnancy, this can be a difficult and frightening time.

Premarital sexual activity among young women is more common in developed countries and in Africa and the Caribbean than in Latin America, Asia, or the Middle East. In the late 1970s in the US, the Netherlands, France, and England and Wales, 40 to 50 percent of girls had had intercourse by age 17; in Sweden, about 80 percent (32, 170, 351, 798). Similarly, surveys of unmarried young women in urban Nigeria and Liberia found that 50 to 60 percent were sexually active by age 19 (397, 673, 752). In contrast, in Mexico City about 8 percent of unmarried girls age 15–19 report premarital intercourse (484) (see Table 8 and box, p. M-360). In Thailand and South Korea less than 6 percent of unmarried girls are sexually active by age 19 (560, 779).

A suggestion of the extent of premarital sexual activity in developing countries comes from survey reports on premarital conceptions. The percentages of women married or in union whose first child was born before or within the first seven months of union range from about 10 in Asian countries to about 20 to 30 in Latin American and African countries (290, 367, 370, 483, 502). Furthermore, the older women are when they marry, the more likely that their first births will be conceived before marriage (290). Because women may deliberately conceal premarital conceptions, they may be even more common than these surveys indicate (483). If premarital pregnancies do not lead to early childbearing, they may lead to illegal abortion instead.

The prevalence of reported premarital sexual activity varies with gender and socioeconomic status. In almost all areas, at any given age males are more likely to have had intercourse, and they report starting sexual activity at an earlier age than females. In Thailand, for example, where very few girls report premarital sex, 25 to 60 percent of adolescent males have had intercourse, often with prostitutes (560).

Several recent surveys focusing on young unmarried males and females of reproductive age yield valuable data (397, 484, 752) (see box, p. M-360). In Ibadan, Nigeria, 49 percent of 16-year-old boys reported premarital intercourse compared with 28 percent of 16-year-old girls (397). In Monrovia, Liberia, 62 percent of boys age 14–17 were sexually experienced compared with 46 percent of girls (752). In Mexico City 42 percent of boys age 15–19 reported that they were sexually experienced compared with 8 percent of girls (484). Premarital intercourse is usually more common among poorer and less educated young people (338, 391, 397, 623, 798). Also, young men tend to report having more sexual partners and having intercourse with casual acquaintances. In contrast, young women usually report that they had their first and subsequent sexual relations with a steady boyfriend or fiancé (298, 391, 409, 484, 560).

In the US, one of the few countries with successive national surveys, more young people of reproductive age became sexually active during the 1970s. In 1971, 28 percent of unmarried 15–19 year old girls surveyed had had intercourse. By 1982 the percentage had increased to 43. They also began to have intercourse at younger ages. In 1971 only one of every seven 15-year-old girls was sexually active. In 1982 the ratio was almost one of every five (360, 563, 798).

What explains these changes in sexual activity among young people? Throughout the world, but especially where rapid urbanization and modernization are occurring, young people are breaking away from constraints applied by their families and communities. The mass media, peers, and other sources of information compete with parents and traditional leaders for influence among young people (397, 455, 610, 813). Mass media entertainment and advertising are filled with presentations of sex as glamorous, exciting, and risk-free (232), "a hobby with unrealistic or no consequences" (395), a pastime of the popular

and affluent. Rock music and other youth-oriented entertainment often seem designed to be sexually stimulating. Also, in developed countries adult behavior has changed as attitudes about marriage, divorce, and sexual activity have become less restrictive. Young people are following—and sometimes extending—adult patterns of sexual behavior (102, 623). In more traditional cultures young women and men often face not only the transition from childhood to adulthood, but also the transition from a society centered on the family and community to a more modern, urban, and individualistic society, where traditional constraints seem less important.

Over the longer term, biological factors also may influence when sexual activity begins. Age at menarche has gradually decreased over the last half century. Studies around the world document a drop of one to two years in age at menarche (186, 235, 262, 264, 391, 649, 784). Better nutrition and quicker accumulation of body fat probably account for this decline (52, 649). In most countries average age at menarche is now 12 to 14 (811). Sexual maturity in boys, as judged by emission of sperm, has been estimated to occur at an average age of 14 (296). Not enough studies have been done to assess whether this age has changed over time.

Contraceptive Use Among Unmarried Youth

The young unmarried woman is particularly buffeted by conflicting social pressures. On one hand, much in her environment promotes sexual involvement—the mass media, her boyfriend, even traditional values that urge childbearing on a young woman, and, in some areas, do not tie it strongly to marriage (232, 351). In fact, where fertility is highly valued, proven fertility before marriage may make a young woman more desirable as a wife (15, 338, 397, 443, 813). Men may demand proof of fertility as a precondition for marriage.

On the other hand, social values also urge a young woman to remain chaste until marriage—in thought as well as deed. She is likely to hear from her parents, her teachers, and her religious advisors, if they broach the subject at all, that sex is proper in marriage only and that reticence and passivity towards sex are valuable feminine traits.

These conflicting pressures may make a young woman feel uncertain or guilty. She may be unable to make a firm decision to say "No" or, alternatively, to plan in advance to use contraception (37, 232, 254, 294, 351, 631). She may not want to think of herself as "the kind of girl who prepares to

Table 8. Sexual Activity Among Young People, Selected Studies, 1974–1985

Region, Country & Year	Ref. No.	Type of Study	Study Participants	Age	% Sexually Experienced		Mean Age at First Coitus	
					Female	Male	Female	Male
AFRICA								
Liberia 1984	752	Stratified household survey of nonstudents; classroom survey of students	1,488 unmarried students & nonstudents age 14–21 in Monrovia	14–17 18–21	46 82	62 93	NA	NA
Nigeria 1981–82	397	Survey of self-selected respondents	1,800 unmarried youths age 14–25 working or attending school in Ibadan area	15 17 19	17 34 63	17 69 86	14 15 17	14 15 16
LATIN AMERICA								
Mexico 1985	484	Probability sample survey of households	1,543 never-married males & females age 15–19 in Mexico City	15–19 15 19	8 4 14	42 20 62	17	16
DEVELOPED COUNTRIES								
Australia 1983	362	Magazine survey	6,500 females age 11–34, marital status not reported	11–13 15 19	17 40 79		15*	
Austria 1977	809	Self-administered questionnaires	516 males & females, marital status not reported	15–17	—25—		NA	NA
Israel 1978	401	Self-administered questionnaires	2,612 males & 2,586 females in high schools	14–15 16–17	7 16	35 46	NA	NA
Japan 1974	42	Self-administered questionnaires	2,671 male & 2,170 female students in 12 cities, nearly all unmarried	16–21	7	15	17*	18*
United States 1979	798 801	National probability sample surveys of households	1,571 never-married females age 15–19 in metropolitan areas of continental US	15–19 15 19	46 22 69		16	
			843 never-married males age 17–21 in metropolitan areas of continental US	17–21 17 21		69 56 71		16
United States 1982	793	Self-administered questionnaires	397 male & 756 female black secondary school students in Baltimore	Most 13–18	70	91	14	12
United States 1982	563	National probability sample survey of women age 15–44	1,752 never-married females age 15–19	15–19 15 19	43 18 66		NA NA NA	

NA = not available

*Mode

have sex" (232); she may equate using contraception with promiscuity or an unacceptably strong desire for sex (254); or she may feel that sex should be "natural" and spontaneous, involving no planning on her part. In short, as one US researcher theorizes, the psychological "costs" of using contraception can outweigh the benefits (426). In other cases, young women may not use contraception because they do not intend to have sexual relations, and their involvement is not entirely voluntary.

Some young women may actually seek pregnancy—or at least may not seek to avoid it—for other reasons. For some, pregnancy may be a way of rebelling against parents, obtaining attention, or forcing marriage (158, 254, 395, 568). Poor young women, without school or jobs as alternatives, may see motherhood giving them a role in life, even if they are not married (158, 165, 395, 692, 821).

Cultural values and social pressures affect young men, too. Most societies maintain a double standard about sexuality, condoning or even promoting premarital sex for men while condemning it for women. In some cultures young men are encouraged to have sex early to "prove their manhood" (323). Many young men are very worried about homosexuality (411). They think that having intercourse and especially getting a girl pregnant are proof of heterosexuality. Also, the stigma of unwed pregnancy and the responsibility for raising the child often are allowed to fall almost entirely on the woman. As a result, many young men assume little responsibility for avoiding pregnancy. Some men refuse to use contraceptives; some object to their partners' using them; and some simply do not think about contraception at all or discuss it with their partners. In a US survey of male students, for example, 55 percent said that they would have intercourse whether or not contraception was available (125).

There is little information on contraceptive use among sexually active unmarried youth around the world. Surveys most often ask youth whether they have ever used contraception at any time. In most surveys fewer than half of sexually active youth report that they have ever used any contraception. The percentages vary widely, from a low of 10 percent in Costa Rica and Kenya to over 90 percent in Australia and some European countries (see Table 9). A smaller proportion are using contraception consistently. For example, in the US in 1979 over 70 percent of sexually active girls reported having used contraception at some time, but only 34 percent said that they used contraception regularly (798). The survey in Monrovia, Liberia, found that only 45 percent of female students age 14–17 who were having sexual relations at least once a month reported ever using contraceptives, and 37 percent were currently using contraception. Among sexually active girls who had left school, only 14 percent had ever used contraception, and 12 percent were current users. Results were similar for males of the same age (752).

Many young couples are not prepared for their first sexual relations. In the US, Mexico, and West Germany, surveys found that 50 to 60 percent used no contraception the first time (309, 484, 801). Even after the first time, young people are slow to seek protection from unwanted pregnancy. In a US survey of 1,200 young clients of family planning clinics, 78 percent waited at least three months after their first sexual encounter before coming to clinics. The most common pattern was to delay almost one year (792). The youngest girls are the least likely to use contraception the first time they have sexual relations (391, 484, 578, 742, 795). Thus those most likely to risk becoming pregnant are those who would face the gravest consequences from unwanted pregnancy (see pp. M-365–367).

Misinformation and Lack of Information

Lack of knowledge about contraceptives and fertility can lead to unwanted pregnancies. For example, of more than 100 Kenyan schoolgirls who became pregnant, 65 had never received any information about contraception (374). In Malaysia a 1976 survey of unmarried male and female factory workers in their early 20s found that 60 percent did

Table 9. Contraceptive Use Among Sexually Active Youth, Selected Studies, 1973–1985

Region, Country & Year (Ref. No.)	Study Participants	Sex	% Using Contraception: Ever	% Using Contraception: Currently
AFRICA				
Ivory Coast 1981 (79)	693 students in Abidjan, marital status not reported	Female Male	79 68	48 43
Liberia 1984 (752)	887 never-married urban students & nonstudents, age 14–25, reporting coitus at least once a month	Female Male	49 31	38 22
Nigeria 1981–82 (397)	887 unmarried urban youths, age 14–25, reporting coitus in past month	Female Male	NA NA	61 41
LATIN AMERICA				
Costa Rica 1980 (72)	246 females age 15–19, >90 percent unmarried	Female	NA	61
Mexico 1985 (484)	253 never-married urban youths age 15–24 reporting coitus in past month	Female Male	NA NA	75 82
DEVELOPED COUNTRIES				
Australia 1977 (633)	314 never-married youths, age 18–25, in Melbourne	Female Male	95 91	NA NA
Japan 1974 (42)	546 students age 16–21 in 12 cities	Female Male	46 60	NA NA
Sweden 1981 (32)	581 females age 19 in Goteborg, marital status not reported	Female	91	63
United States 1981 (125)	527 unmarried urban black males age 11–19 in Baltimore	Male	80	60[a]
United States 1979 (798)	937 unmarried females age 15–19 in metropolitan areas of continental US	Female	73	34[b]
United States 1982 (49, 50)	622 never-married females age 15–19	Female	NA	69[c]

[a]Percentage using contraception at last coitus (N = 500).
[b]Always use.
[c]Based on women exposed to the risk of unintended pregnancy who had sexual intercourse in the last three months and were not pregnant, postpartum, seeking pregnancy, or noncontraceptively sterile.

Surveys of Youth Yield Varying Findings

In Mexico, Nigeria, Liberia, the Philippines, and the US, large surveys have recently gathered information on the prevalence of sexual activity, knowledge and use of contraception, and STDs among young married and unmarried women and sometimes men. Similar surveys are planned or underway in Guatemala, Kenya, Tanzania, and Zimbabwe. Beyond these surveys, little representative survey information is available specifically on fertility and family planning among youth.

In **Mexico** CORA and the Mexican Academy of Medical Demography, with technical assistance from the US Centers for Disease Control (US CDC) and Family Health International (FHI), conducted a household survey in 1985 of almost 3,000 young adults age 15–24, both married and unmarried, in two large districts of Mexico City. Some 42 percent of men age 15–19 and 83 percent of men age 20–24 reported having intercourse compared with only 8 percent of women age 15–19 and 23 percent of those 20–24. Only about one-fourth of sexually active respondents had used any contraception at first coitus. Among the 253 young men and women reporting sexual relations in the month before the interview, contraceptive use was common. Some 75 percent of these women and about 80 percent of these men used some method. Over half of these women relied on calendar rhythm, however, and only about 31 percent used very reliable methods—OCs or the IUD. Similarly, over 40 percent of the men relied on either rhythm or withdrawal. Just under 16 percent used condoms (484).

In **Liberia** a representative sample survey of young men and women in Monrovia was conducted in 1984 by the Ministry of Health and Social Welfare and the Demographic Unit of the University of Liberia, with technical assistance from FHI. Some 1,488 unmarried students and working youths were interviewed. Over 40 percent of women age 14–17 and over 60 percent of men age 14–17 reported premarital sex (see Figure 3). Among the 887 respondents having intercourse at least once a month, almost 40 percent of the women and 22 percent of the men reported that they or their partners were currently using contraception. Seventy-five percent of these women said that they were using OCs. Over 50 percent of these men used condoms. Many reported having had STDs—about one in every four sexually active men and one in every five sexually active women (752).

In **Nigeria** the University College in Ibadan, with technical assistance from FHI and the Pathfinder Fund, conducted a survey in Ibadan of 1,800 unmarried men and women age 14–25 in 1981–82. Just over one-third of all 17-year-old women and just over two-thirds of 17-year-old men reported premarital intercourse. Almost two-thirds of the women and 41 percent of the men having intercourse at least once a month said that they were using contraception. OCs and condoms were the most common methods. Some 38 percent of women used OCs. Almost one-fourth of the men used condoms. Despite the relatively common use of contraception, pregnancy rates were very high. Among some 454 sexually active women, 47 percent reported having had at least one pregnancy. About 90 percent of these pregnancies ended in illegal abortion (397).

In the **Philippines** the University of the Philippines Population Institute in 1982 surveyed over 5,200 married and unmarried women age 15–24. According to preliminary analysis, overall 12 percent reported that they had had sexual relations before marriage. Among those married when interviewed, however, 39 percent said that they had had sex before marriage. This discrepancy suggests that either the unmarried were not willing to talk frankly or the married women were most likely to have had intercourse with their fiancés. About half of the urban married women reported sex before marriage, compared with about one-third of rural married women (558).

In the **United States** three national surveys especially of young women have been conducted since 1971 by researchers from the Johns Hopkins University (360, 798, 818, 840). Another large survey, conducted in 1982 by the US National Center for Health Statistics, involved all women of reproductive age, including young women (563). The surveys, each of which interviewed about 1,700 young women, almost all unmarried, show marked changes in sexual behavior over time. The proportion of unmarried young women reporting intercourse by age 17 increased from 26 percent in 1971 to 40 percent in 1982 (563, 798). In 1971 about 47 percent of sexually active women reported that they had used contraception the last time they had had intercourse (818). In 1982 over two-thirds of young women who had had sexual intercourse in the three months before the survey were using contraception (49, 563). Two-thirds of the young women using contraception used OCs, and 21 percent relied on condoms (49).

Surveys of fertility and family planning among young, unmarried people present unique difficulties. First, interviewers may have to visit a home six or seven times before finding the young person at home. Second, because sexual activity among young, unmarried people is often sporadic, rates of sexual activity and contraceptive use are difficult to define and to interpret. As a result, the various surveys often are not closely comparable. Third, discrepancies within the surveys suggest a variety of interpretations. For example, in Mexico young men more often described their sexual partner as a "friend or casual acquaintance," while almost all young women described their sexual partner as a "fiancé or steady boyfriend" (484). Also, in Liberia 75 percent of the young women who had sexual relations at least once a month said that they used OCs, while only about 30 percent of the young men said that their partners were using OCs (752). This discrepancy suggests that many men did not know what, if any, contraceptive method their partners were using.

not know about family planning (523). In the Nigerian survey, sexually active young women, 45 percent of whom had been pregnant, most often cited lack of information as the reason for not using contraception. Sexually active young men also cited this reason most often (397).

Reasons for Not Using Contraception Given by Sexually Active* Young Men and Women, Ibadan, Nigeria, 1981–82

Reason	% Citing Reason	
	Women	Men
Lack of knowledge	42	33
Concern about safety	23	24
Partner objects	5	12
Contraceptives not available	3	15
Thought unnecessary	7	7
Other	11	9

*One or more sexual contacts during the past month.

Source: Ladipo et al. 1983 (397).

What knowledge young people have about fertility and contraception, they have picked up mostly from friends and the media (36, 79, 125, 161, 162, 169, 234, 343, 375, 397, 401, 512, 578, 752). For example, among 700 secondary school students in the Ivory Coast, 53 percent reported that their main source of information about contraception was the media, and 33 percent said friends (79).

Information from friends and the media is often incomplete, misleading, or wrong. Mass media entertainment, for example, almost never mentions contraceptives or even family planning in general. At the same time, however, the National Federation for Decency reported an average of 2.81 references to sex per hour on US prime time television (820). Other studies estimate up to 4.3 references to intercourse and "discouraged sexual practices" such as prostitution and rape per hour of prime time television (655). Many of these shows are rebroadcast in other countries. News reports emphasize contraceptive failures and side effects, often overdramatically.

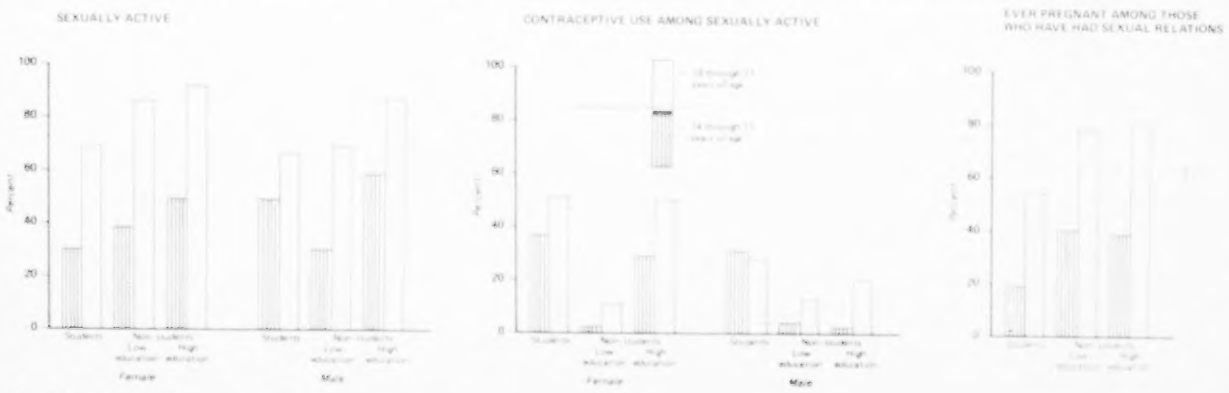
Thus myths and misperceptions about fertility and contraceptives are widespread. In the Philippines, for example, it is reported that young women try to prevent pregnancy by douching, by standing up after intercourse, or by taking oral contraceptives only on the days that they have intercourse (235). In Nigeria some girls take large quantities of vitamin pills after intercourse, thinking that vitamins will prevent pregnancy (192). Many young people believe that pregnancy cannot occur if they are very young, if they are having sex for the first time, or if they have intercourse infrequently (161, 338, 792). Few realize that the chances of pregnancy may be as high as one in three if intercourse takes place at the time of ovulation (437). Also, many are mistaken about when the fertile part of the menstrual cycle occurs (125, 338, 397, 633, 752). Among almost 700 black male secondary school students in the US, for example, only 10 percent knew that a woman's fertile period occurs roughly midway between menstrual periods (125).

Mistaken notions about modern contraceptives also are widespread among the young, as they are among older people (419). For example, in a US survey nearly half of girls interviewed thought that condoms broke easily and were ineffective (577). Unfounded fears about side effects are common (294, 338, 397, 637, 792, 797, 800). These fears lead sexually active young couples to risk unwanted pregnancy. In the Nigerian survey (see table at left), the second most often cited reason for not using contraceptives was concerns about their safety (397). In Campinas, Brazil, 88 percent of young unmarried women giving birth in a teaching hospital had never used contraception. Fear of side effects was the major reason (637). In the US, 27 percent of sexually active young women delayed coming to family planning clinics because they thought that contraceptives were dangerous (792). It is not known how many never came at all because of their fears. Over 70 percent of girls interviewed at a secondary school in Benin City, Nigeria, thought contraceptives would harm their health and cause infertility. Some 30 percent of those interviewed had had at least one illegal abortion (511).

Limited Access

Young people find it more difficult to obtain contraceptives than older, married couples. In most countries laws restrict young people's access to family planning information and services much more than they restrict that of older men and women (324, 366, 816). A few countries prohibit all distribution of contraceptives to the unmarried or to young people. For example, Indonesia prohibits distribution to anyone who is not married or who is younger than age 17 (538, 587). Less severe restrictions, such as requirements for parental consent or notification, exist in most countries. These requirements do not prohibit young people from obtaining contraception, but they may discourage them. For example, in Britain a court ruled

Figure 3. Sexual Activity, Contraceptive Use, and Pregnancy Among Youth in Monrovia, Liberia, 1984



(Graphs courtesy of Joyce Sherman)

Working with the Media in the United States

Mass media influence young people's attitudes about sex (105). In all regions of the world young people report that the media, rather than their parents, their teachers, or their physicians, are a major source of information about sexuality. But what are young people learning from the media? The image of sexuality in the US media, which reaches much of the world, is both unrealistic and irresponsible, critics charge. Such criticism has been mounting recently and has come from sources as varied as the American College of Obstetricians and Gynecologists (ACOG), a state commission, major newspapers, and *TV Guide*, the largest circulation magazine in the US (382, 638, 817, 826, 828), as well as from the US public (280). Television, radio, and the movies glorify sex yet ignore its consequences—unwanted pregnancy, early motherhood, and sexually transmitted diseases. References to sex are frequent, but mention of family planning is rare. The US viewer sees three or four references to sex per hour of TV watching. Six times in every seven, sex on TV involves people not married to each other (425, 812). The example set forth by the media, some think, encourages risk-taking and sexual activity among the young.

In the US, several groups, concerned about the frequency of adolescent pregnancy, drug abuse, and other problems, are encouraging the media to promote more responsible sexual behavior and to help parents guide their children. For example, an organization of concerned parents, the Parents' Music Resource Center (PMRC), asked the recording industry voluntarily to put a special warning label on records that contain explicit sexual language, profanity, references to violent behavior and the occult, or glorification of drugs and alcohol (529). Such a label or rating, PMRC believes, would give parents some say in the kind of records their children buy (53). The involvement of the wives of important political figures drew attention to the issue, and in late 1985 the recording industry announced that all record companies would print the lyrics on record album covers. Printing special labels or ratings on album covers will be optional, however.

Other organizations also are trying to work with television, radio, and the recording industry. In July 1985 ACOG launched a nationwide public information campaign warning young people to avoid unintended pregnancies. The campaign involves television, radio, and newspaper and magazine advertisements offering a pamphlet on contraception free to anyone who calls a toll-free telephone number. The pamphlet urges young people to abstain from sex or, if they are sexually active, to use effective contraception. The major television broadcast networks that reach most Americans at first refused to show the ads because they used the word "contraceptives" and the networks thought the topic too controversial (31). After discussion and much publicity about the issue, the networks agreed to broadcast the ads, but only after the word "contraceptives" was deleted (817). After the ad was broadcast during a football game, over 500 people called the toll-free telephone number in 24 hours (269). The US public supports showing more information about family planning on television. In a national poll 78 percent of adults surveyed said that television should present messages about birth control as part of its programming (280).

The Planned Parenthood Federation of America has developed four short television spots encouraging parents to be the primary sex educators of their children. The advertisements, shown in October 1985 on all major US television networks, featured two popular television and movie stars presenting the message (287).

Another US organization, the Center for Population Options (CPO), has produced radio advertisements featuring popular entertainers and sports figures. These ads referred sexually active young people to family planning clinics (623). In addition, CPO's Media Advisory Committee conducts information seminars and provides technical assistance for media professionals (104, 107).

in 1984 that parental consent was required for anyone under age 16 to obtain contraception. The ruling cut attendance in half at some of the Brook Advisory Centres, private family planning clinics for young people. The number of girls under age 16 coming to several of the clinics with unwanted pregnancies increased. These girls had not come for contraceptives before they became pregnant because they were afraid that they could not obtain them confidentially (87). The 1984 court decision was overruled in October 1985.

Some countries have modified laws to make it less difficult for sexually active young people to prevent unwanted pregnancy. In Hong Kong and Thailand, for example, contraceptives are now available to everyone regardless of age or marital status (538). In the US, the Supreme Court in 1977 voided a state law that prohibited sale of nonprescription contraceptives to anyone under age 16 (721). Swedish law requires doctors to maintain the same confidentiality when providing contraceptives to minors as when serving adults (89). A number of countries, including China, Costa Rica, and the Philippines, along with many European countries, now require sex education in the schools (366, 538, 588).

Family planning service programs have varying policies on serving unmarried people. At one extreme, some refuse to do so. At the other, a few make special efforts to serve sexually active young people. Most make no special effort but expect young people to use the same services that other clients use. But young people often are reluctant to do so. These services are usually geared to older, married women. Young people feel out of place and uncomfortable. Also, they may fear that they will meet their mothers or family friends (338, 610, 623, 665). In the US, 43 percent of girls who came to family planning clinics had delayed coming after they became sexually active because they feared that their parents would find out (792).

Even when there are no substantial legal barriers, many private doctors are reluctant to provide contraceptives to the unmarried. In Panama, Mexico, and India, it is reported that most doctors would not ordinarily provide contraceptives to unmarried young people (293, 765, 809).

In the US and Canada only about half of doctors surveyed would prescribe contraceptives to unmarried girls without parental consent (78, 513). In addition, some doctors have been concerned that OCs will impair future fertility (779). This has made them reluctant to provide OCs to young women. Their fears are unnecessary. No evidence suggests that a young woman's use of OCs will impair her future fertility or pose serious health hazards (419, 514).

In some countries young people can buy contraceptives in stores and pharmacies. But, with little or no income of their own, many young people cannot afford them. For example, around 1980 the cost of a year's supply of OCs in 20 developing countries ranged from about $6 (US) in Egypt to about $90 in Nigeria. In Nigeria this would have amounted to 22 percent of the average annual per capita income (612).

REPRODUCTIVE HEALTH PROBLEMS

Efforts to prevent illness and death caused by human reproduction have usually been devoted to the older woman, over age 35, who already has had many children at close intervals. Today it is becoming increasingly clear that sexually active young people face serious health risks, too. The young person who is physically and emotionally unprepared for sexual intercourse, pregnancy, and childbearing faces possible lifelong harm. Moreover, if young people have children, their children also face greater health risks. These risks are preventable, yet many families and communities are not aware of the full extent of the reproductive health problems of young people. Thus efforts to prevent these problems are new and tentative.

Among the major reproductive and sexually related health hazards that face young people are:

- Sexually transmitted diseases (STDs);
- Unwanted pregnancy, including illegal abortion and complications of abortion;
- Higher risks of maternal morbidity and mortality;
- Low birth weight and prematurity among the children of very young mothers;
- Higher risks of infant morbidity and mortality.

Health hazards related to early sexual activity and childbearing can be the major health risks facing young people. Complications of pregnancy and childbirth are the leading cause of death among young women in a number of countries, including Mexico, Peru, and the Philippines (693). At the Johns Hopkins Hospital, which serves a poor urban area with high rates of sexual activity and pregnancy among young people, just over half of the admissions to the children and youth department in 1982–83 were related to pregnancy and STDs (275).

Sexually Transmitted Diseases

Sexually transmitted diseases (STDs) are a major health problem among young people worldwide. Accurate incidence rates are not available in most countries. Nevertheless, clinical impressions, hospital and population surveys, and government statistics suggest that STD rates among young people are high in many countries and may be rising (163, 245, 263, 264, 265, 391, 455, 546, 560, 570, 650, 715, 733, 740, 770, 813). Both young women and men risk contracting STDs if they are sexually active, unless they use condoms or perhaps spermicides, which protect to varying degrees against STDs (629, 630).

The long-term consequences of STDs are grave, particularly for young women and their children. Many STDs—particularly gonorrhea and chlamydial infections—cause pelvic inflammatory disease (PID), irreversible damage to the fallopian tubes, ectopic pregnancy, or infertility. A young woman may be rendered sterile before she has ever married or had a child. Also, syphilis, genital herpes infections, and possibly mycoplasma infections can cause spontaneous abortion, stillbirth, or perinatal death (228, 392). When a woman with gonorrheal or chlamydial infection gives birth, her child may contract severe eye infections. If untreated, these infections can cause partial or total blindness (171). In men also, STDs can damage the upper reproductive tract and cause infertility. Inflammation and scarring of the epididymis and vas deferens partially or completely block the passage of sperm. In addition, men may experience urethral inflammations and adhesions and perineal fistulae (abnormal openings), causing chronic pain and problems with urination (25, 70, 82, 517) (see **Population Reports**, *Infertility and Sexually Transmitted Disease: A Public Health Challenge*, L-4, July 1983).

Gonorrhea is one of the most common sexually transmitted diseases. In developed countries rates of reported gonorrhea in young women age 15–19 range from about 500 per 100,000 in the UK to about 1,500 per 100,000 in Sweden. In the US, gonorrhea is the most frequently reported communicable disease, and young people are the most likely to contract it. In 1982–83 youths age 15–19 accounted for nearly 25 percent of all reported US cases, and young adults age 20–24, for nearly another 40 percent (708). Between 1960 and 1979 gonorrhea rates in US girls age 10–14 increased threefold, and among girls age 15–19, fourfold (715). In the 1980s rates have declined, perhaps as a result of more medical screening, referral of sexual partners, and rapid identification of asymptomatic carriers (531). Also, concern over contracting such incurable diseases as herpes simplex and acquired immune deficiency syndrome (AIDS) may have led to changes in sexual behavior that have reduced transmission of STDs. In Sweden STD rates in young people increased markedly from the 1950s to the early 1970s. Since then, with the implementation of public programs to eliminate STDs, to increase condom use, and to provide comprehensive sex education in the schools, rates have declined steadily (733).

Increasing evidence suggests that sexually transmitted infections with *Chlamydia trachomatis* are very common (99, 101, 225, 677). In Sweden rates of chlamydial infection are about 4 percent in women age 15–19 and 7 percent in women age 20–24 (746). In the US, in different populations of various ages, from 5 to over 20 percent of women had lower genital tract chlamydial infections (624, 677). Unlike gonorrhea, chlamydia is difficult to diagnose—in part because there are often no acute symptoms to alert women. Pelvic inflammatory disease and infertility may result (101, 677, 737).

Although data are difficult to obtain, STDs are thought to be common among young people in many developing areas, also. In Thailand and Singapore young people comprise up to 40 percent of clients treated for STDs in gov-

ernment clinics (560, 570). In the Liberian survey almost 10 percent of respondents age 14–17 reported that they had had an STD, as did almost 25 percent of respondents age 18–21 (752). (These cases may not have been verified by a health professional, however.) In hospitals and clinics in Uganda and Nigeria during the 1970s, 13 to 20 percent of clients treated for STDs or PID were under age 20 (252, 650). In parts of Nigeria STDs are so common that in young men a urethral discharge, actually symptomatic of infection, is mistakenly considered a sign of sexual potency (650). At the University of Swaziland about 90 percent of students seeking medical treatment from the campus nurse had STDs (813).

Young people often fail to obtain proper treatment for STDs. Some may not know that they have a disease; others are hesitant to seek help. Few countries have health facilities solely for young people, and unmarried youths often are too embarrassed to attend a clinic with adults (264, 455, 620, 770). Instead, many go to unqualified shopkeepers to buy antibiotics without medical advice. Improper treatment may mask the symptoms without completely curing the infection. As a result, it is more likely that the diseases will be transmitted to others and that infertility and other secondary complications will occur (263, 264, 517).

Attention is now focusing on AIDS, a recently recognized disease that can be transmitted sexually. AIDS is currently incurable and nearly always fatal. Most cases have died within five years (707, 714). AIDS has been found in every region of the world. By September 1985, 13,228 cases had been reported in the US, 969 cases in 14 European countries, and 1,090 cases in Canada, Central America, and South America (274). Reports of AIDS also come from 13 African countries (552, 713, 725) and from Australia and Hong Kong (275). AIDS can be spread in several ways: by homosexual or heterosexual intercourse (279, 575, 709); by contaminated needles (714); by transfusions of contaminated blood and blood products (149, 714); and from mother to infant during pregnancy and childbirth (150, 616). In developed countries AIDS has occurred predominantly in homosexual men and intravenous drug users (150). In parts of Africa, however, the disease is found as often in women as in men (552, 725). The risk of contracting the disease through sexual relations increases with the number of sexual partners (150, 725) and with certain sexual practices (150).

Other serious diseases also are linked with frequent early sexual activity. Increasing evidence suggests that early age at first coitus and multiple sexual partners increase a woman's risk of developing cervical dysplasia (abnormal precancerous cells) and cervical cancer (60, 127, 299, 462, 592). In a recent Canadian study, for example, women who started coitus before age 18 were almost two times as likely to have cervical dysplasia as women who started coitus later. At the same time, women who reported six or more sexual partners faced a fivefold greater risk of dysplasia than women who had had only one partner (127). Cervical cancer is thought to be caused by infection transmitted by sexual intercourse (222, 569, 640). During adolescence the cervix undergoes cellular changes and so may be more vulnerable to such infection (141, 421, 639).

Hepatitis B, a serious infection of the liver, is transmitted by sexual intercourse and also passed from the mother to the infant during pregnancy and childbirth. Over 200 million people worldwide are thought to be carriers of the hepatitis B virus (526). The virus causes chronic liver damage and leads to liver cancer, one of the 10 most common cancers in the world (525, 526).

Unwanted Pregnancy

Unwanted pregnancy is one of the greatest problems a young girl can face. Pregnancy may endanger her health, her chances for education and marriage, and many of her hopes and plans for the future. She may even be disowned by her family. Many adolescents are too young, too poor, or too inexperienced to care for a child. Consequently, some young women turn to abortion. Where abortions are performed by unskilled providers in unsafe conditions, the risks of serious health complications and death are great.

In developed countries in 1980 and 1981, among young women the rate of legal abortions—which are the only abortion procedures for which reliable data are available—ranged from 5 per 1,000 women age 15–19 in the Netherlands to 44 in the US. Abortions in young women account for more than 10 percent of all abortions in 14 of 19 areas with complete records and for more than 25 percent in four of these—Canada, Great Britain, Norway, and the US. In almost all countries the rates of legal abortions among young women have changed little since the mid-1970s (115, 678).

The extent of illegal abortions among young women is unknown. Hospital records of women treated for complications of abortion are the major source of information, but these records include only women who sought treatment and were hospitalized. In Latin America almost 15 percent of women hospitalized in the 1970s for abortion complications were younger than 19. This is a much higher percentage than in the 1960s, which suggests that the rate of illegal abortion among young women may be rising in Latin America (318).

Illegal abortions are thought to be very common among young women in Africa, where contraceptives are not readily available, particularly to young unmarried women. Hospital statistics from cities in Kenya, Liberia, Mali, Nigeria, and Zaire show that 38 to 68 percent of women hospitalized with abortion complications were 19 or younger (17, 21, 73, 136, 752). In the Liberian survey 18 percent of sexually active women age 21 or younger reported that they had had at least one induced abortion (752). In the Nigerian survey 41 percent of sexually active women age 14 to 25 reported that they had had induced abortions (397). In another Nigerian study, involving 530 schoolgirls, 30 percent said that they had had illegal abortions (511). In Ghana 46 percent of 160 women age 19 or younger giving birth at Korle-Bu Hospital reported that their first pregnancy had ended in induced abortion (400).

The health risks of illegal abortion have not been exactly measured, but clearly they are great. In 10 hospitals in Zaire one of every 50 women admitted for complications of illegal abortion in 1982–83 died in the hospital (136). In Kenya's Kenyatta National Hospital between 1972 and 1977, 18 percent of maternal deaths were directly related to illegal abortion (431). Severe but nonfatal complications also are common and may have long-term consequences

(318). Young women are at greater risk of severe complications because they often delay abortions until well into the second trimester of pregnancy (161, 254, 573). Where illegal abortions are performed by untrained persons under unsanitary conditions, as many as 1,000 per 100,000 women may die, although in most places the ratio is much lower (678). In contrast, the mortality ratio for legal abortion among young women under 20 in the US during the 1970s was 1.3 per 100,000 procedures (100); the maternal mortality rate was 6.2 per 100,000 live births (716), or almost five times higher.

Health Consequences of Pregnancy in Adolescents

Pregnancy in very young women, even when wanted, is more dangerous to both the mother and child than pregnancy at a later age. Although national data often combine all women age 15–19, health risks are much greater before age 17. These young women face greater risks of obstetric complications and are more likely to die during pregnancy and childbirth than women in their 20s. The risks are greatest for the very poor, who have the worst diets and the least opportunity for prenatal care (430, 830). (See **Population Reports**, *Healthier Mothers and Children Through Family Planning*, J-27, May-June 1984.)

Young women, like women over age 35, face a greater risk of death in childbearing than women in their 20s. In rural Bangladesh in 1968–70, mortality rates at various ages were:

Mother's Age	Maternal Deaths per 100,000 Live Births
10–14	18
15–19	7
20–24	4
40–44	8

Source: Chen et al. 1974 (116).

In Jamaica and Nigeria it has been found that women younger than 15 are four to eight times more likely to die during pregnancy and childbirth than women age 15–19 (282, 750). Even in developed countries the youngest women are at a striking disadvantage. In the US in 1977 the maternal death rate among mothers under age 15 was 2.5 times higher than the rate among mothers age 20–24 (24).

The major life-threatening complications for very young mothers are pregnancy-induced high blood pressure (also called preeclampsia, toxemia, or, if seizures occur, eclampsia), iron-deficiency anemia, and cephalopelvic disproportion. Preeclampsia has been called a "special hazard" of pregnancy among the very young (23) because it occurs so often among adolescents and among women having their first child (39, 62, 168, 178, 310, 499, 536, 584, 750). In a Nigerian study, for example, 17 percent of pregnant young women age 14 or younger developed eclampsia compared with 7 percent of pregnant 16-year-olds and only 3 percent of pregnant women age 20–24 (282). If untreated, pregnancy-induced high blood pressure can cause congestive heart failure or stroke (156). In England and Wales between 1973 and 1975 preeclampsia and eclampsia accounted for 20 percent of maternal deaths in 16–19 year old women (680).

Iron-deficiency anemia also is a special risk for the young mother. Anemia is common in the first four years after menarche even among those who are not pregnant (29).

Spacing births will help a young mother see that her next child is healthy and well-nourished. Children born too close together are more likely to die than children born at least two years apart. (Toutounji/UNICEF)

Along with the high growth rate around the time of puberty, the beginning of menses, and poor nutrition, pregnancy can deplete the body's iron reserves (140, 176, 336, 604). The prevalence of anemia during pregnancy in young women varies widely, ranging from about 7 percent in the US to over 30 percent in Africa (39, 168, 178, 282, 310). Severe anemia in pregnancy can lead to premature delivery and both maternal and fetal death (54).

Cephalopelvic disproportion—when the infant's head is too large to pass easily through the mother's pelvis—can slow or even prevent vaginal delivery. If a cesarean section cannot be performed, uterine rupture and maternal and infant death can result. Cephalopelvic disproportion occurs often in very young mothers since pelvic growth is not usually complete until several years after menarche (472).

Prenatal care can markedly reduce pregnancy-related mortality and complications among all women, especially very young women (83, 157, 282, 300, 430, 445). In a study of almost 22,000 Nigerian women, for example, the death rate among mothers 14 or younger who had received good prenatal care was 500 per 100,000 live births, whereas the rate in mothers of the same age who had not received care was 4,300 per 100,000—a ninefold difference (282).

In fact, however, prenatal care is not available to many women in developing countries (500, 776). Moreover, very young women are less likely to receive care than older women (223, 644). They are also more likely to receive care only late in pregnancy. A young woman may be late in obtaining prenatal care for a number of reasons. If unmarried, she may be ashamed of her pregnancy and afraid that her parents will find out. She may refuse to acknowledge the pregnancy or simply not realize that she is pregnant (90, 600). Inadequate services, particularly for very poor adolescents, also are an important problem (140, 644). Whatever the reason, the delay can be costly to the health of both mother and child.

Health Consequences for the Child

Childbearing at a very early age can be a handicap for the child as well as the mother. The infant of an adolescent mother is more likely to be of low birth weight and to die. Low birth weight is a major cause of infant mortality and morbidity. Children of very young mothers also are more likely to experience later problems, including delays in development and poor performance at school.

Many studies in developed and developing countries report higher rates of low birth weight, prematurity, and neonatal and infant mortality in children of young mothers than in children born to women age 20–29 (40, 111, 114, 184, 186, 282, 310, 405, 406, 435, 447, 450, 495, 504, 576, 595, 601, 625, 671, 726, 771). World Fertility Survey data for 35 countries of Africa, Asia, Latin America, and the Caribbean also show that mortality rates are consistently higher among infants of young mothers, under age 20, than among infants of mothers age 20 to 29. In some countries—Thailand, Bangladesh, Pakistan, Sudan, and Malaysia—the rate is 50 percent higher or more (41, 119, 601).

The risks of low birth weight and infant mortality are greatest for the children of the youngest mothers—15 or younger—and among adolescents having their second or third child, implying close spacing of births (181, 184, 186, 282, 346, 495, 504, 619). In a large study in northern Nigeria, nearly one in every five infants born to mothers age 15 or younger died during the perinatal period (that is, counting both stillbirths and deaths in the first 30 days of life). This was about 1.6 times the mortality rate for infants of mothers age 16 and 2.5 times the rate for infants of mothers age 20–24 (282).

Behavioral factors—failing to obtain prenatal care, smoking, using drugs and alcohol, stress, and poor diet—are often more common among women under age 20 and play a large role in the poor outcome of pregnancy (465) (see box, p. M-369). In addition, the complications of pregnancy and childbirth found in young women—anemia, preeclampsia, and cephalopelvic disproportion—can lead to serious complications or death for the infant (282, 472, 591). With good prenatal care and adequate nutrition, mortality and complication rates among children of all women other than very young girls can be greatly reduced (184, 186, 405, 406, 435, 446, 456, 591, 804).

The higher risk of serious complications and death among children of adolescent mothers persists through early childhood. In almost three-quarters of 40 developing countries with WFS data, mortality rates between ages one and two were higher for children born to adolescent mothers than for children born to mothers age 20–29, and in 13 of the 40 countries they were at least 20 percent higher (601). In the US, children of adolescent mothers are significantly more likely to die within the first two years of life and to suffer serious illness than children born to older women (406, 625). Sudden infant death syndrome (SIDS) is more common in children of younger mothers, according to some research (71, 393, 394, 430, 547). Also, low birth weight babies lag behind other children in growth even as late as age seven (584). The children of young mothers tend to lag somewhat behind other children in cognitive development and school performance, as well, and they may have more problems interacting with other children (55, 128, 277, 406, 422, 510). In a British study of all children born in 1970, children born to adolescent women were more likely to be involved in accidents and to be admitted to hospitals for accidents or gastrointestinal infections in the first five years of life. One reason for these findings is that early pregnancies are more common among poorer, less educated women. Nevertheless, these data also suggest that younger mothers may not supervise their children as well as older mothers (674). Even as adolescents, these children may face problems. Daughters of young mothers are more likely to become young mothers themselves (565), and so the cycle of poverty continues.

SOCIAL CONSEQUENCES OF EARLY MOTHERHOOD

For very young mothers, the risks of childbearing do not necessarily end with delivery. As the Caribbean researcher Tirbani Jagdeo notes:

> . . . teenage pregnancy is not simply a matter of numbers and medical consequence. It is also a matter of human possibilities, of life chances. Teenage pregnancy stymies both the personal and social development of young women. . . . Young women end up paying dearly in their later life for mistakes made when they were still children. (340)

Compared with a woman who delays childbearing until her 20s, the woman who has her first child before age 17 is likely to:

- obtain less education,
- be out of work,
- have a lower-paying job and less income,
- be separated from her partner or divorced.

Attitudes about early childbearing vary in different areas. In developed countries and in some developing areas such as the Caribbean, many women marry or enter consensual unions after age 20, and most early pregnancies are unplanned and unwanted. In contrast, in many developing countries, especially in South Asia and Africa, girls marry young, and early childbearing within marriage brings social status and respect. Thus the social consequences are very different depending on whether a young woman is married or not, even though most women who have children very young face limited education, limited job opportunities, limited choices for the future, and a high degree of dependency.

Educational Consequences

For a young girl in secondary school or university, an unwanted pregnancy can be a catastrophe. In developing countries schoolgirls who become pregnant almost always leave school, whether they are married or not (455). An unmarried girl usually is not allowed to stay in school or to return after the birth of her child (327, 337, 345, 455, 512, 536, 752). In a Nigerian study of 127 pregnant schoolgirls, for example, 52 percent were expelled from school, 20 percent were "too ashamed to return," 15 percent could not return because their parents refused to pay tuition, and 8 percent were forced to marry (512). In Kenya pregnancy forces about 10 percent of the girls enrolled in secondary schools to drop out each year (374). In Swaziland about 5 percent of female students in urban schools and 6 percent in rural schools become pregnant each year (193). About 80 percent of Swazi girls who drop out of school leave because of pregnancy (813). Many young girls resort to dangerous illegal abortions to avoid leaving school.

In the US and the Caribbean more girls drop out of school because of pregnancy than for any other reason (24, 340). Some might have dropped out of school anyway (279, 582), but early pregnancy makes returning to school more difficult (96, 231, 376, 388, 564, 600, 604, 776, 825).

Some developing countries, such as Jamaica and Ghana, are modifying policies and allowing girls to return to school after their babies are born, although usually not to the same school that they first attended (266, 337, 770). The burden and expense of child care prevent most girls from taking advantage of the opportunity, however (265). Women's centers designed to help such young women finish school and find jobs are opening in a very few countries (see p. M-374), but they scarcely begin to fill the need.

Economic Consequences

In developed countries young mothers often are poor because they are not married and have no husband to help support the family. In the US, women giving birth before age 20, whether married or not at the time, are two to five times more likely to be separated from their partners or divorced within five years than women giving birth in their 20s (96, 231, 388, 449, 478, 506). Many young women marry only because they are pregnant, and so their marriages are more likely to fail. Reports from Fiji, Indonesia, the US, and Yugoslavia suggest, however, that marriages among the very young are less stable than marriages among older couples regardless of whether the woman is pregnant when she marries (175, 217, 478, 506, 770).

In developing countries, especially in rural areas, women have few opportunities for economic advancement. Thus early pregnancy may not make their economic prospects much worse. In urban areas, however, where opportunities for women are greater, early childbearing may have the same damaging effects as in developed countries. A survey in Guatemala, for example, found that in periurban areas women who gave birth before age 17 were living in poorer homes and had less work experience than women who gave birth later (186). In some instances young, unmarried mothers may be forced to turn to prostitution to support themselves and their children (345, 813).

Young men also may suffer educational and economic consequences from early fatherhood. Young fathers are less likely to graduate from high school or college than their classmates. In a US longitudinal study comparing young men of similar socioeconomic status, race, and academic ability, those who became fathers before age 19 were one-third less likely to graduate from college than men who had children after age 24 (96). With little advanced education, young fathers tend to find only low-paying jobs (376). Since many young men evade the responsibilities of fatherhood, however, on average they suffer fewer ill effects than young mothers (95).

COUNSELING AND HEALTH SERVICES FOR YOUTH

The extent of sexual activity, pregnancy, and their health and social consequences among young people of fertile age is only now being recognized as a major health and social problem in many countries. How to deal with and especially how to prevent these problems are major concerns and topics of debate among parents and at all levels of the community — a concern reflected by entities ranging from the World Health Organization to international church groups to national news magazines (26, 770, 814, 815, 832, 836, 837). The fact that many young people lack knowledge about reproduction and do not know where to turn for accurate and sympathetic advice is well-documented. In response, various services are now being developed, often on a pilot basis. These activities are designed to help young people achieve better family life and reproductive health. They include programs for parents, young pregnant women and young mothers, in-school youth, and out-of-school youth.

Pregnancy can jeopardize a young woman's future, as this poster from The Gambia warns. In Africa pregnancies among schoolgirls are increasing. Once pregnant, these girls rarely return to school.

The work undertaken ranges from lectures and individual counseling, which are most common, through innovative use of various media such as radio, television, and theater to health services in clinics and youth centers. These activities have been undertaken by many different organizations including churches, community groups, governments, health agencies, and family planning associations.

Programs for Parents

Most people agree that parents *should* talk to their children about human reproduction and *should* discuss both biological facts of life and moral standards for sexual behavior. Nevertheless, in practice parent-child communication on sexual matters is often minimal or nonexistent. In the Ivory Coast, for example, only 10 percent of 700 young

people had talked with their parents about human sexuality and contraception (79). Similarly, in Nigeria not one of 127 pregnant girls had ever talked to her parents about human sexuality (512). In Grenada it is reported that mothers often do not even tell their daughters about menstruation (338). In the US, a national survey found that 76 percent of parents had talked with their children about sex, but only 33 percent had discussed birth control (280).

Both parents and youths are reluctant to discuss sexuality with one another. Young people are often too embarrassed or too afraid of their parents' disapproval (79, 125, 338, 374, 401, 523, 610). Parents may be embarrassed or may not know much about sex themselves. They may find it difficult to put their thoughts into words. In the US, for example, most parents recognize that they need help providing sex education to their children. Some 85 percent support sex education in the schools (280).

Programs have been developed specifically to help parents start discussions with their children. These programs can teach parents basic information, help them feel more comfortable talking about sex, and suggest techniques for approaching the subject in ways that are reassuring and sympathetic. Church agencies in Indonesia, Madagascar, Kenya, and Malawi are urging parents to talk to their children about sex and family life (120, 466, 492). For example, in Kenya at Chogoria Hospital, which is managed by the Presbyterian Church of East Africa, more than 3,200 parents attended one-day training sessions offered over a 14-month period. Topics covered included risks of early pregnancy, STDs, emotional development in adolescence, and alcohol and drugs (120). Similarly, in Mexico the Centro de Orientación para Adolescentes (CORA), a multiservice youth program, gives lectures on sex education to parents. These lectures cover communication techniques to help parents talk with their children about sexuality as well as information about sex and reproduction (109). In the US the Family Guidance Center in St. Joseph, Missouri, runs programs for fathers and sons and for mothers and daughters. The programs include small-group discussions, lectures, films, and other activities designed to help parents and children talk to each other about sex (380, 807). A variety of other agencies also sponsor programs for parents in the US (126). About 120 such programs have been identified throughout the country (108).

Sex education begins at home and continues in the schools, says this poster from Brazil. Parents' behavior toward each other is children's most important source of sex education, it points out.

Family Life Education in the Schools

To what extent should schools, especially publicly funded schools, provide family life and sex education for young people? If the schools do cover these subjects, should they cover only basic reproductive biology, or should they include a broader range of family life issues such as the responsibilities of marriage and parenthood, value judgments on male and female virginity, family size, and the role of women in marriage and society? Should they provide information on family planning methods? On sexually transmitted diseases? Should they provide basic demographic information about population growth and its economic and social consequences?

Currently, there are more questions than answers, and school systems have responded to the challenge in various ways. The schools often have very limited resources, however, especially in developing countries, and community attitudes are mixed. Thus, most programs operate on a small scale in areas with strong community support.

The extent of family life or reproductive health education in the formal school system varies greatly, even within countries. In both Europe and the US, local governments usually control the content of courses (368, 391, 410, 651). In most northern and western European countries, sex education courses are required by national law. In fact, however, sex education in taught either not at all or in a cursory fashion (410, 777).

One innovative program to help young people postpone sexual involvement has been developed at Emory University and Grady Memorial Hospital in Atlanta, Georgia. This program helps boys and girls to recognize and resist social and peer pressures to be sexually active. Over 1,000 young people have participated in field testing. The program is now being offered in the Atlanta public schools and to 60,000 other young people throughout the state (75, 302).

In Asia extensive government-sponsored population education programs operate in Bangladesh, China, Hong Kong, Indonesia, South Korea, the Philippines, Singapore, and Thailand, and efforts are planned in India, Malaysia, Pakistan, and Sri Lanka. In China in 1984 population education was taught in 40,000 secondary schools to some 12 million students (226). Some programs, such as those in Pakistan and Bangladesh, avoid any reference to contraception, whereas others, such as those in China, Hong Kong, and Thailand, include information about contraception (226, 770) (see **Population Reports**, *Population Education in the Schools*, M-6, March-April 1982).

Health Problems of Young People: Accidents, Alcohol, Tobacco, and Drugs

Young people of fertile age are the healthiest age group in society. They have survived the heightened susceptibility to infection that endangers the very young and have not yet developed the chronic or degenerative diseases that afflict the elderly. Thus the health risks that young people do face often go unrecognized, even though many of these risks, both physical and psychological, could be avoided through better family and community support.

Accidents are the leading cause of death and disability among young people (699, 838). In developed countries accidents—primarily motor vehicle accidents—account for about half of all deaths at age 10–19 (590, 772). In developing countries death from such accidents as falls, fire, poison, and drowning are common because emergency medical care is often not at hand (1). In addition, for every person killed in an accident, 10 to 15 are seriously injured, and 30 to 40 are slightly injured (775). Murder and suicide also are major causes of death among young people, especially in urban areas (590, 772, 838).

Alcohol

Alcohol consumption among young people is a continuing concern. In developing countries sharp increases in alcohol consumption among the young have been reported (112, 229, 666, 734, 749). In developed countries consumption increased in the 1970s but may be dropping somewhat in the 1980s (348).

Many young people, often responding to pressure from their peers, are experimenting with alcohol. In the US and Australia more than 90 percent of secondary school students have drunk alcohol at some time (348, 749). In recent surveys in developing countries, the percentage who drink ranges from about 13 percent among 15–19 year olds in India (666) to 75 percent among young men in Costa Rica (469). A smaller percentage of young people drink heavily. In the US about 19 percent of young people age 14–17 are "problem drinkers"—that is, their alcohol consumption causes problems in the conduct of their lives (2). In a Zimbabwe survey of 254 secondary school and university students, 10 percent reported being drunk three to seven times a week (112).

More young people in developing countries are drinking. Alcohol often leads to accidents—a major cause of death among the young. Also, drinking during pregnancy can injure the fetus. (Almasy/WHO)

Less experienced than adults, young people are more inclined to take risks and seek new experiences (617). This tendency is exaggerated when alcohol has clouded their judgment (65, 497, 540). Alcohol consumption is often the reason for accidents with vehicles, including bicycles, motorcycles, and automobiles (84, 92, 164, 590). In the US, for example, in 1983 some 38 percent of fatal auto accidents among youth age 16–24 involved alcohol, compared with 26 percent at all other ages (712). Alcohol also plays a role in other accidents, such as drownings and falls.

Young people are more apt to engage in unplanned and unprotected sexual activity after drinking (42, 162, 391, 409, 540). In a Swedish study involving 71 sexually active adolescents, 40 percent of the young women and 63 percent of the young men reported that they had been drinking at the time of first intercourse (409).

Drinking can have serious consequences for reproductive health. Drinking during pregnancy increases the risks of spontaneous abortion, low birth weight, and physical and mental birth defects (152, 353, 378, 384, 420, 470, 497, 782). Also, excessive drinking can contribute to infertility in both men and women (3, 627).

Smoking

Smoking is a major public health problem around the world. Among young people, especially young women and boys and girls age 10 to 14, the use of tobacco is increasing. Youthful smoking often starts a lifelong dependence that is very difficult to overcome. Most confirmed smokers begin smoking before age 18. Few begin after age 21 (581, 735, 803).

In most developed countries many young people smoke. According to recent surveys in 11 countries, more than 30 percent of male and female adolescents smoke, and in six countries, more than 40 percent (441). Once a predominantly male habit, smoking recently has been increasing rapidly among women (253). Only in Scandinavia, where governments have been waging aggressive antismoking campaigns since the mid-1970s, has smoking declined among both young men and women (11, 441, 503, 586, 719, 732).

In developing countries also, many young people smoke. In most countries more than 20 percent of young men smoke regularly (440, 442). In some Latin American countries—Chile and Uruguay, for example—about 50 percent or more of 15-year-old girls and boys smoke (440, 441). In Senegal 70 percent of schoolboys smoke, and in China and Indonesia, over 30 percent (440, 442, 787). Smoking remains less common among young women.

(Continued on next page)

Health Problems of Young People

(Continued from previous page)

The serious health hazards of smoking are proven. They include lung cancer, oral cancers, chronic lung diseases such as emphysema and bronchitis, and ischemic heart disease. Smokers have more sickness and hospitalization and shorter life spans than nonsmokers (493, 574, 718, 719, 774). According to recent estimates, tobacco use accounts for almost 2.5 million deaths worldwide each year (574, 806). Smoking poses special risks for women and their children. Smokers are more likely to develop cervical dysplasia or cancer than nonsmokers (127, 829). Older women who both smoke and use oral contraceptives face a much greater risk of circulatory system disease than if they took OCs but did not smoke (387). Also, women who smoke may take longer to conceive than nonsmokers (51). In addition, smoking during pregnancy causes low birth weight, shortened gestation, higher perinatal mortality, higher rates of spontaneous abortion, and more frequent complications of labor and delivery (133, 385, 468, 501, 572, 719). Infants who live with smokers face a greater risk of bronchitis, pneumonia, asthma, and otitis media (806, 829).

Tobacco and Alcohol Advertising

Although difficult to measure precisely, advertising of alcohol and tobacco—especially mass media promotion—influences young people's choices about smoking and drinking. Worldwide, the tobacco and alcohol industries spend massive sums advertising and promoting alcohol and cigarettes. Typically, advertising portrays smoking and drinking in a very positive light, suggesting that those who smoke or drink possess sophistication, glamour, and virility. Recently, some tobacco advertising has been designed to appeal especially to young people and to women (98, 214, 258, 732, 768). Almost everywhere bright cigarette ads are prominently displayed on billboards, and, except in the few countries that prohibit them, ads are broadcast over radio and television (308, 747). Alcohol advertising, especially beer advertising, also is often designed to appeal to young people, particularly young men.

Both industries promote their products ingeniously and persuasively. Tobacco and alcohol companies sponsor sports and social events that attract young people (98, 214, 732, 734, 747, 748, 768). In Scotland, for example, the tobacco industry sponsored nearly one-fourth of the sporting events televised in 1981 (768). Alcohol companies print brand names and logos on clothing and other products (734). Cigarette companies hold raffles and give away prizes ranging from T-shirts to expensive cars (308).

Consumers and especially young people in developing countries lacking long experience with large-scale advertising are particularly susceptible to alcohol and tobacco advertising (734). Moreover, the health risks of smoking and drinking are not widely publicized (439, 735). Few countries restrict sales of cigarettes or have smoking prevention programs (439, 609, 774). Many countries restrict sales of liquor to young people, but these laws often are not enforced (764).

Parents also influence whether their children smoke (18, 81, 182, 253, 272, 349, 566, 599, 732). In a US survey, for example, about 14 percent of boys age 12–18 from homes where both parents smoked also smoked themselves; 9 percent of boys from homes with one smoking parent smoked; and only about 6 percent of boys with nonsmoking parents smoked (253).

Other Drug Abuse

Use of illegal drugs, like drinking and smoking, appears to be increasing among young people, with serious health and social impacts (19, 306, 485, 537, 647, 699). Some areas report frequent drug use among youths. For example, in Colombia 65 percent of secondary school students report having used drugs (135), and in the US, 72 percent (359). Heroin use is spreading rapidly among urban youth in many Southeast Asian and Western Pacific countries (305, 699), and a marked increase in use among urban youth has been reported in Ireland and Italy (189, 770).

Cannabis (marijuana) is the most commonly used illegal drug (305, 699). Other common drugs include opiates such as heroin and cocaine, amphetamines, barbiturates, and hallucinogens (189, 305, 699, 770). Health risks of long-term use of some of these drugs include severe malnutrition; drug-induced psychoses; impaired liver, kidney, and lung function; and sudden cardiovascular collapse (305, 699). In addition, drug use is often a factor in traffic and industrial accidents and in suicide (180, 699).

Although most young people trying drugs are experimental or occasional users rather than habitual users, even short-term use poses serious risks. First, drug use tends to impair a person's ability to learn and to perform daily activities or a job safely and productively. Second, using impure materials or accidentally overdosing can cause serious infection or even death (229, 305). Third, sharing hypodermic needles can spread serious, even fatal, infections such as serum hepatitis and acquired immune deficiency syndrome (AIDS) (see p. M-364). Fourth, the expense involved in drug use leads many young people to theft or prostitution (67, 399).

Although the causes of drug abuse are complex and interwoven, surveys in various countries have found that the principal reason youths give for trying drugs is "curiosity," followed in frequency by desire to obtain relief from problems (135, 391, 617) and peer pressure (399). Young drug users often report a disturbed family situation and failure at school or employment and often are migrants to the city (13, 363, 414, 537, 647). Those who use alcohol and tobacco are more likely to use illegal drugs as well (67, 363, 770, 785, 790). Thus some of the same pressures that lead to early sexual activity also lead young people to damaging health practices that they later regret. Some of the same types of support programs that encourage sexual restraint and responsibility are also attempting to prevent drug abuse, excessive drinking, and smoking.

In Latin America and the Caribbean, sex education has been widely taught for several years in Mexico and Panama (676, 770). In some countries such as Antigua, West Indies, however, sex and family life education is taught only in home economics classes and so reaches very few young men (705). Pilot in-school programs are underway in several countries, including Brazil, Chile, Costa Rica, Dominica, and the Dominican Republic (45, 538, 676, 705). In the Dominican Republic, for example, PROFAMILIA, the family planning association, developed a sex education curriculum in 1981. The curriculum was tested and revised by teachers, counselors, and students in a secondary school in Santo Domingo. With the support of parents and school administrators, the school formally adopted the curriculum. In 1984 the Ministry of Education began to implement the program in schools nationwide (535). Another sex education curriculum has been developed by the International Planned Parenthood Federation (IPPF) Western Hemisphere Region and the Caribbean Family Planning Affiliation (CFPA). In 1984 they published a teacher's guide, *Teaching Human Sexuality in Caribbean Schools—A Teacher's Handbook* (411). The handbook will be distributed throughout the eastern Caribbean by Ministries of Education and CFPA (332). A Spanish-language version has been prepared, modified and adapted for Latin American schools.

In a number of countries, school principals and teachers invite staff and volunteers from family planning associations to lecture in the schools. In Trinidad and Tobago, for example, family planning workers lectured to more than 11,800 students in 1984 (206), and in Suriname and St. Vincent both, to over 8,000 (658, 664).

Family planning associations in Africa are working in schools and developing family life education materials. In Zimbabwe the Youth Advisory Service of the Child Spacing and Family Planning Council has developed a family life education program for schools throughout the country. Started as a pilot program in 1978, the service now employs 13 advisors who give lectures in school and offer personal counseling. In 1983 the advisors gave over 1,460 lectures, reaching 58,000 students (802). In Nigeria in 1984 staff members from the Planned Parenthood Federation of Nigeria lectured in 410 schools in 15 states. In addition, they worked with parent-teacher associations to increase parental involvement in the sex education programs (507). In Mauritius the public schools use a family life education booklet developed by the Mauritius Family Planning Association (327, 823). WHO and IPPF are collaborating on a project on youth education and services for health and family life in four countries—Botswana, Lesotho, Malawi, and Swaziland. The project will evaluate existing educational efforts and assess the educational needs and priorities in each country (326).

In all regions the scarcity of teachers trained to teach family life education handicaps programs both in and out of school. Teacher training is now underway with government support in countries as diverse as Egypt, Honduras, Kenya, and South Korea (262, 301, 328, 628). Private agencies, including educational and religious organizations, also organize teacher training. In Kenya Chogoria Hospital provides one-week training courses for primary and secondary school teachers to prepare them to teach family life education (120). The National Christian Council of Kenya, the Family Planning Association of Kenya, and the

A page from a chartbook by the Family Planning Association of India offers parents help in communicating with their children.

Family Life Association of Swaziland also train teachers (262, 813). In Mexico CORA offers intensive training courses of 25 to 100 hours for teachers at the primary, secondary, and university levels (474).

Training teachers can be a formidable task. Like parents, most teachers know very little about human reproduction and tend to be uncomfortable talking to students about sexuality. At present, sex education and family life education are not included in the curricula of teacher training colleges in most countries (770). Any training that teachers receive takes place on the job. Most training in family life education for in-service teachers is short, however, usually ranging from two to four hours to one week. This may be too little time to study even basic information, let alone such complex issues as values and attitudes about sexuality and how to discuss them effectively.

What is the impact of sex education programs in the schools on sexual activity and pregnancy rates among young people? All studies report that, contrary to some fears, sex education courses do not lead to sexual experimentation or promiscuity. Sex education does increase young people's knowledge about human sexuality (233, 379, 380, 527, 653, 739, 799). What other impact it may have is not clear. Surveys in the US found that students who took sex education courses were less likely to have had sexual intercourse (233) or, if they were sexually active, more likely to use contraception than those who had not taken such courses (799). The studies could not determine conclusively, however, whether the courses were responsible for the differences in behavior.

Education for Out-of-School Youth

Most young people in developing countries go to school for only a few years, if at all (see p. M-351). The needs of the large numbers of out-of-school youths are critical—particularly recent migrants and the very poor, who have little access to any education or services. Reaching out-of-school youths is difficult, however. A number of strategies have been used: educational talks in community or church youth groups or at the workplace, counseling in family planning centers, community outreach programs, and informational campaigns in the media (622).

In a few countries, mainly in Asia, extensive government programs focus on out-of-school youth. For example, since 1973 the Philippine Ministry of Social Service and

Development has conducted a nationwide program to teach population and sex education to youth groups. The program reaches about 175,000 youths annually. Another program, run by the Ministry of Labor and Employment, organized population and development clubs for young Filipinos out of school. The clubs offer education on human sexuality, family planning, and population along with recreational activities such as sports competitions and cultural festivals. Between 1981 and 1983, 95 clubs were organized, and almost 13,000 youths attended lectures and discussion sessions (557). In Thailand the Ministry of Education integrates population education and family planning information into out-of-school programs offering literacy training, school equivalency education, and vocational training (560).

In Africa church organizations have been reaching out to young people for many years. In Togo, Uganda, and Ghana, for example, churches have conducted family life education programs for youth since the 1960s. Activities of church-sponsored programs have also been reported in Kenya, Nigeria, and Tanzania (262, 490, 492). The National Christian Council of Kenya offers to all members of its congregations a family life education program that includes discussion of contraceptive methods (262).

Many family planning associations work extensively with out-of-school youth. The Barbados Family Planning Association, in collaboration with government agencies, held over 1,400 lectures and reached over 50,000 people between 1975 and 1981 (705). Some organizations hold special courses or talks on sex education for young people at the family planning headquarters, as in Hong Kong, Mauritius, and Panama (194, 330, 490, 638). Some associations have brought family life education for young people to the workplace. The Guyana Responsible Parenthood Association conducts such courses in business and government offices. The program began when several employers asked the association for help after a number of their young employees became pregnant (261). Family planning associations and other private organizations in such countries as Chile, Guatemala, India, Jamaica, Mauritius, Mexico, Pakistan, and Sri Lanka include information on family planning, human sexuality, and responsible parenthood in vocational training programs and programs at the worksite (27, 200, 202, 203, 207, 295, 311, 327, 626). In India, for example, one program for young women teaches family life education along with techniques of bookkeeping and financial management. The young women plan to set up profit-making projects on their own (200, 626).

Youth-to-Youth Programs

One of the most persuasive forms of communication is person-to-person contact with peers. A number of programs work with young leaders and counselors—often called "peer counselors," "youth multipliers," or "youth promoters"—to reach and teach other young people.

To date, programs in about 20 countries have used peer counselors, almost always volunteers, to communicate with other young people. In Latin America and the Caribbean, programs in about 10 countries have trained peer counselors to carry out various educational activities (46, 207, 211, 327, 559). In Asia peer counselors play a large role in educational and community development projects in the Philippines, Thailand, and Sri Lanka (204, 205, 207, 557, 560). In Africa peer counselors do community outreach work in Ghana and Kenya (207, 209, 210).

Most commonly, peer counselors give talks and conduct group discussions on responsible parenthood, family values, human sexuality, STDs, and family planning. Most programs train peer counselors in these areas and also in communication skills. The extent of training varies widely. Some US programs provide up to 300 hours of instruction and role playing (327). After training, peer counselors work with schools, youth clubs, churches, and mothers' groups. Initially, they may approach these organizations on their own to schedule talks and meetings. As they become known in the community, schools and other institutions ask them to come and speak. Peer counselors also may counsel young people individually, visit them at home, and speak informally with friends. In Kenya, for example, peer counselors visit young mothers at home to discuss breast-feeding and good infant nutrition as well as family planning (208). In the Philippines they provide family planning information to couples who have applied for marriage licenses (317). In the UK and West Germany young volunteers with the Grapevine program talked with young people in pubs, discotheques, and concerts (144).

In some areas young people are providing information and education to the entire community, not just other young people. Young volunteers have carried out many information and education projects to increase youth and community awareness of overpopulation and the need for family planning. In 1983 the Youth Committee of the Family Planning Association of Sri Lanka conducted a series of workshops for new young members of the association, for officers of rural development societies, and for government officials in rural areas. The Youth Committee also conducted 24 population education programs for schoolchildren, held seminars for 149 teachers, trained the leaders of 12 youth clubs, and conducted seminars for various other volunteer youth organizations (203). Furthermore, about 80 percent of the 37,000 volunteers in the association's community-based rural family health program are between ages 18 and 25 (204). In 1984 the volunteers organized 862 projects, such as talks on health and nutrition, religious and cultural activities, and community development activities, involving more than 320,000 people (205). In some villages the volunteer efforts raised contraceptive use from 40 percent to 70 or 80 percent (204). In Hong Kong a group of youth volunteers, called the Society of New Generations (SONG), takes part in numerous information and educational activities, presenting family life education at the worksite and to groups of young people and participating in community service projects and social activities (194, 327). Young people carry on similar activities in Singapore (330), India (198, 789), and Kenya (236). In Mexico peer counselors with CORA develop recreational and crafts activities for young people and participate in survey research (474).

There are some difficulties in using peer counselors, however. To be most effective, they need careful preliminary training and regular supervision. Both activities require substantial time from program staff. But young people's lives change frequently—because of graduation, marriage, and changing jobs—and thus many programs report a rapid turnover among peer counselors (144, 212, 317, 557).

"Love on the run creates bread and water children," sing Tatiana and Johnny, popular young Latin American performers, in a TV video promoting their song "Detente" ("Wait"). The song urges young people to postpone sex until they can be responsible parents. (Fuentes y Fomento Intercontinentales)

In many areas family planning associations have involved young people in the development and implementation of programs. Associations in Asia were among the first to establish councils or committees of young people. The Family Planning Association of Sri Lanka, for example, created its Youth Committee in 1975 so that young people could help develop programs for their peers. Indeed, in both Sri Lanka and The Gambia the family planning associations changed their constitutions to ensure youth representation (204, 323). Several other family planning associations, including those in Pakistan and Nepal, have established youth councils to work on projects for young people (323).

Family planning associations also help young people carry out community development projects. One of the first, the national Youth Development Project in the Philippines, organized young volunteers into 15 local chapters of the Family Planning Organization of the Philippines. The chapters carried out activities to benefit communities, including beautifying the villages, teaching nutrition, organizing sports tournaments, providing family planning information, and providing contraceptives when requested (329). In Pakistan the Family Planning Association Youth Project now sponsors youth groups in 42 locations. The association trains leaders from these organizations and supervises club activities (201). Working independently or with association staff, the clubs perform various community activities such as setting up libraries, organizing recreational activities, and giving lectures on population dynamics and family life (201, 202, 329). In Kenya youth welfare clubs affiliated with the Family Planning Association of Kenya have helped to build a nursery school (236).

Theater

To reach wider audiences, programs for youth have used a variety of media, both traditional and modern. An innovative way to convey information is through informal amateur theater productions. Scenarios are improvised by young actors to explore the problems that young people face. Dramas by and about young people are performed in such countries as Burkina Faso, Chile, Kenya, Mexico, and the US.

In Mexico CORA sponsors annual theater competitions open to young people age 12–22. The contestants write, produce, and act in their own plays. Local officials and celebrities judge the performances, and prizes are awarded. The plays have dealt with all areas of concern to young people, from sexual development to political corruption. Since the first competition in 1980, over 6,100 youths have performed before more than 270,000 people. Even hard-to-reach youths, such as members of street gangs, have participated (475).

In Africa performances by local groups are a common form of entertainment and well-suited to reaching young people. In Burkina Faso a theater troupe organized by the National Institute of Literacy and Adult Education tours the country, performing full-length plays on a number of topics—youth concerns, sexual harmony in marriage, family planning, and STDs. Each performance is followed by discussions with the audience that sometimes continue for several hours (453). In Kenya the Nairobi University Youth Welfare "Movers" Band composes songs promoting family planning and performs for the Family Planning Association of Kenya at important public functions (236).

In the US the Washington Area Improvisational Teen Theater uses the acronym WAITT to convey one of its important goals: encouraging young people to wait—to delay sexual activity and childbearing until they have finished school and started their careers. Since 1981 WAITT has performed for over 30,000 young people, parents, and professionals (553, 567). In New York the Teatro Hey theater group has given bilingual performances in Spanish and English to more than 5,500 people since 1981 (751).

Newspapers, Radio, and Television

Mass media are beginning to be used to provide information about reproductive health. Articles for and about young people have been printed in newspapers and magazines in many countries. Young people in Costa Rica and the US have prepared pamphlets and other educational material on sex education and on fertility awareness for their peers and for adults (424, 805). In Argentina, Guyana, Hong Kong, Indonesia, Montserrat, the Philippines, Swaziland, Trinidad and Tobago, Uruguay, and Zimbabwe, family planning associations have produced radio programs for the young (194, 206, 261, 327, 330, 403, 476, 623, 813). In some cases these programs respond to young people's specific concerns. In Trinidad and Tobago and in Hong Kong, for example, radio programs for youth take telephone calls from listeners and answer their questions on the air (206, 330). In Sri Lanka the medical director of the Family Planning Association of Sri Lanka wrote a weekly newspaper column, answering letters sent in by readers (61).

A number of organizations have produced television programs, songs, movies, or television videos about young people and reproductive health issues. In 1983 the Hong Kong Family Planning Association filmed short sex education talks that were broadcast as part of a weekly television program, "Teens' Magazine" (195). In Mexico CORA collaborated with local television networks to produce a soap opera about the problems of adolescents. The show is

now being broadcast in other Spanish-speaking countries (110). Also in Mexico, a communications company, Fuentes y Fomento Intercontinentales, has produced a 45-rpm record of popular songs with accompanying music videos. The songs, sung by Tatiana and Johnny, two well-known recording artists, emphasize postponing sexual activity (230) (see photo, p. M-373). In Zaire the Comité National des Naissances Désirables has produced a one-hour movie, "N'gambo," describing the plight of an unwed schoolgirl who becomes pregnant. The film emphasizes that the girl's parents had not given her any information about sexuality and family planning except to "distrust boys." In Argentina, Dominica, and Uruguay, young people, with the sponsorship of family planning associations, have produced their own films and video tapes on youth problems (243, 321, 662).

Intensive media campaigns have been carried out in a number of countries. The Family Planning Association of Trinidad and Tobago launched a campaign in 1984 to remind young people of the risks of pregnancy, STDs, and accidents during Carnival, the annual celebration before the observance of the Christian Lent. Flyers with the slogans "Dance, Prance but Don't Chance" and "Merriment Without Abandonment" were distributed to young people in schools, youth groups, and other organizations (206). In Jamaica the National Family Planning Board has developed a campaign to encourage young women to delay childbearing. It uses the slogan, "Before you be a mother, be a woman" (see box, this page). A new campaign, addressed to young men, uses the slogan, "Before you be a father, be a man" (14). Media campaigns to promote male responsibility also have been carried out in Hong Kong and the US (195, 554, 623, 827).

Multiservice Programs

Separate health and family planning programs for young people are uncommon. For the most part, young people are not considered a distinct group needing special care. Yet young people often will not use existing health and family planning services that focus on older men and women. Staff members usually are not trained to work with young people. A few organizations, however, have developed services especially for young people. One innovative approach is multiservice youth programs.

Multiservice programs offer a wide range of services to help young people in many facets of their development. Such programs may offer medical services, psychological counseling, vocational training, job counseling, cultural and recreational activities, family life education, and family planning help. Some even provide dental care and legal advice. Most rely heavily on young volunteers to carry out many of their activities. While most centers attract young men and women in equal numbers and are oriented toward prevention, a few programs have been designed specifically for those in most urgent need—pregnant girls and young mothers who need help preparing for childbirth and motherhood.

Mothers' programs. Multiservice programs serving young pregnant women and new mothers are operating in Chile, Jamaica, the Philippines, the US, and Uruguay (46, 276, 452, 458, 557, 808). They serve the medical needs of these young women and their infants and provide individual and group counseling on childbirth and parenting. In Chile programs for pregnant girls are run by maternity hospitals in Santiago and Valparaiso. In 1984 over 1,000 pregnant girls attended the clinics for more than 4,100 prenatal and postpartum visits (43). In the US and the Philippines, programs maintain temporary shelters for young women who cannot stay in their homes (452, 557, 808). Mothers' programs also may provide family planning services and help young mothers return to school or work after their babies are born. Some supply day care for the children for as long as two years after birth. In Uruguay staff members visit homes to help young women whose infants are at high risk of health and developmental problems (46).

One of the first programs for pregnant young women and young mothers in a developing country was the Women's Center, which has operated in Kingston, Jamaica, since 1978. Clients receive remedial tutoring in language and mathematics, family life education, and day care for their babies for about six months. Then they go into schools or training programs. Since the start of the program, over 1,000 young women have participated in Center activities. Repeat pregnancies are unusual. Among 234 women who attended the Center between 1978 and 1979, only 8 percent had conceived a second time by the end of 1981 (458).

The Women's Center has had considerable impact in Jamaica. Because of the efforts of Women's Center staff, Jamaican school officials are now more willing to accept formerly pregnant women back into the school system (458). A similar women's center opened in Kenya in 1985, and another is scheduled to open in Sierra Leone in 1986 (532).

In the US the Florence Crittenton Agencies provide a wide range of services for pregnant girls and young parents. The agencies offer prenatal and postpartum care, programs to help young women stay in school after giving birth, vocational training, and child care. Currently 39

"Before You Be A Mother...."

In Jamaica a multimedia campaign is underway to encourage young people to delay childbearing. It is sponsored by the National Family Planning Board of Jamaica. The slogans of the campaign are: "Before you be a mother, be a woman," and "Before you be a father, be a man." The message appears on radio, television, bumper stickers, posters, and newspaper ads. Even a 45-rpm record has been produced, with lyrics sung to a reggae beat. This is the first verse:

I remember when I was a little girl,
I met a young man who promised me the world.
I was fourteen years, he was in his prime.
He said "Woman, I love you, let's have a good time."
I thought I knew what love was all about
But when you check it, when you hear from the shout,
The man was gone, I was on my own,
About to have a youth and all alone.*
I should have been smart, I shoulda used my head,
I shoulda did listen to what everyone said.
Everyone told me,
Don't jester, little girl,
Don't spoil your future.
Before you be a mother, you got to be a woman.
Oh, you got to be a woman.
Oh, you got to be a woman.
Oh, you got to be a woman.

*A baby

agencies operate throughout the US. The 24 of these agencies that are associated with the Child Welfare League serve about 12,000 people each year (808). About 75 programs funded by the federal Adolescent Family Life Program carry on similar activities. These programs also try to discourage young people from engaging in premarital sex and emphasize adoption as an alternative for the young mother who does not want to keep the child (835).

Comprehensive programs can markedly reduce health risks to the young mother and her child. In the US, the Johns Hopkins Hospital Adolescent Pregnancy Program offers medical care, health and parenting education, and individual counseling to pregnant girls. Girls in the program were less likely to develop toxemia or anemia during pregnancy, had fewer hospital stays, and had significantly fewer low birth weight babies than teenagers receiving only standard prenatal care. They also were significantly more likely to obtain well-baby care and immunizations for their children. As a result of less sickness and fewer serious health problems, medical care for each mother and child in the program, from pregnancy to two years after delivery, cost $847 (US) less than in the group receiving no special care (276). In St. Kitts, West Indies, the infant mortality rate among children of young mothers and the rate of second pregnancies were lower among young mothers participating in the Teenage Family Life Education Project than among young mothers who received no special care (690, 691).

A recent US study suggests, however, that some of the benefits of short-term programs for young mothers—12 months or less—may diminish once services end. In Project Redirection, a multisite comprehensive program for poor adolescent mothers, most of the young women participated for 12 months. After one year the young mothers were significantly less likely to have had a second pregnancy and were significantly more likely to be in school and to be using contraception than young mothers who were receiving less comprehensive services or no services at all. By 24 months, however, when most of the young women were no longer receiving special services, there were no differences between the groups in pregnancy rates, school enrollment, or contraceptive use. These results suggest that special programs for young mothers are extremely effective while the mothers are enrolled, but longer programs may be needed to help very disadvantaged young mothers remain in school and further delay a second pregnancy (555).

Multiservice youth centers. Many multiservice youth centers have been modeled after The Door, a large, privately funded program in New York City established in 1972. The Door maintains a staff of over 100 paid workers and about 90 volunteers. Services provided include counseling, drug and alcohol abuse treatment, medical care, family planning, vocational counseling and training, and recreational programs. Over 15,000 young people visit The Door every year. Its staff has assisted several multiservice programs in Latin America (357).

CORA is the oldest and the largest multiservice program in Latin America. Established in 1978, CORA now has two centers in Mexico City and one in Tamaulipas State in northern Mexico. CORA offers medical, psychological, and recreational services, and it organizes an annual theater competition (see p. M-373). CORA trains health professionals from Mexico and other countries and helps parents talk to their own children about sexuality (see p. M-368). Between March 1978 and June 1985 there were over 140,000 visits for information and counseling, most of them from young men. There have been over 12,000 visits for medical care or psychological counseling. CORA staff have presented more than 6,100 talks on sex education and family planning to over 33,450 young people, parents, and youth volunteers (474).

Extensive multiservice programs also operate in Chile. The Ministry of Health and several universities sponsor seven centers—two exclusively for pregnant young women (see p. M-374), four for students, and one, started in 1984, a pilot program for poor youth (43). These centers, with assistance from the Asociación Chilena de Protección de la Familia (APROFA), offer general medical care, family planning, and educational services. In 1984 more than 5,500 young people came to the centers for family planning counseling (43).

Another Chilean program, sponsored by the Instituto Nacional de Capacitación (INACAP), opened in 1985. Throughout Chile about 12,000 young people age 14–24 are affiliated with INACAP, the largest labor union and training institute in the country. Many of these youths have left school and are either unemployed or working in factories as apprentices.[2] INACAP is collaborating with APROFA to provide free medical, social, psychological, and family planning counseling and referrals. In all five INACAP centers, APROFA conducts day and evening workshops on the problems and concerns of young people, including the health risks of adolescent pregnancy. As part of the workshops, young people are taken to orphanages, often filled with children suffering severe malnutrition and other health problems, and to centers for drug addicts. On these visits the young people witness the problems arising from unwanted pregnancies and the risks involved in using alcohol and drugs (143, 311).

In Jamaica Operation Friendship offers health care and vocational training. A clinic provides general medical care, pre- and postpartum care, pediatric care, and dental services. The program also houses a day-care center for children and a school for pregnant young women (659). The vocational program offers training in automobile mechanics, woodworking, industrial sewing, air conditioning/refrigeration repair, and lithography. Over half of the young people trained since 1979 have found permanent jobs (27). An unusual aspect of Operation Friendship is its efforts to train women in occupations that are usually filled by men, such as lithography. All students in the first lithography class and two-thirds of the second class—all women—have found jobs (10).

School-based clinics. A new trend is school-based health and family planning clinics. These clinics are operating in more than 35 schools in 18 communities in the US and in Sweden (89, 410, 822). They are located either in the school or close by. Most offer a wide range of services including general health and gynecological examinations, treatment for minor acute illnesses, screening for STDs, laboratory tests, counseling on sexuality and family planning, and prescriptions for contraceptives. In the US about half of these clinics actually provide family planning methods. The others refer students to nearby clinics or health centers. Some clinics also provide services for the pregnant student or young mother—prenatal and postpartum care.

pediatric care, and day care for the children (9, 166, 381, 410, 822).

The school-based clinics are popular. From 70 to 90 percent of the students in the schools, both male and female, have used clinic services (381). One such center, the Adolescent Primary Health Care Center in Houston, Texas, which is available to about 8,000 students from seven schools, serves over 6,000 clients every year (723). In the US, most adults want the schools to do more. In a nationwide poll 67 percent favored requiring public schools to establish links with family planning clinics. Some 29 percent opposed the idea, and 4 percent were undecided (280).

Although school-based clinics are too new to have been fully evaluated, initial reports suggest that they can decrease pregnancy rates markedly. One of the oldest programs, the St. Paul (Minnesota) Maternal and Infant Care Project, established in 1973, is now operating clinics in four schools. The birth rate among students in these schools declined from 59 per 1,000 students in 1976–77 to 26 in 1983–84. In 1982, in contrast, the fertility rate among 15–19 year olds in St. Paul was 62.5 per 1,000 (657). In Baltimore the pregnancy rate among students in schools with clinics declined by 26 percent in 28 months. In contrast, the pregnancy rate in other schools, which did not have clinics, rose by 51 percent, with the greatest increase among girls under age 15 (794). Pregnancy rates also have declined among students using school-based clinics in Texas and Michigan (166, 571, 794).

Advantages and disadvantages. Multiservice programs, whether in schools or out, have many important advantages. These programs can respond to varied needs in one place. For many young people, these programs may be the only available source of general health care. The variety of services, particularly the recreational activities, attracts large numbers of youth (357). At the same time, the variety of programs protects the privacy of clients seeking family planning help. School-based clinics have the added advantage of being easily accessible. Follow-up is easy and, therefore, contraceptive use is continued longer.

Multiservice programs have disadvantages, too. A major problem is the high cost of providing so many different services. Most programs face chronic funding problems. Almost all of the US school-based clinics, for example, are funded only partially by the schools and so rely on private agencies. Most lack a stable source of support (166, 381). In the US the estimated annual cost per student served is $100 to $125 (US) (166, 381). Extensive use of volunteers helps to keep costs down. Arranging for volunteers and collaborating with other organizations is difficult, however, and staff turnover is frequent. Some multiservice programs raise money by selling pamphlets and books on adolescence and by holding training programs for health professionals (474, 556).

Youth Programs Within Family Planning Programs

Family planning organizations in a number of countries have added special services for young people. They include: (1) a separate unit or center, associated with a family planning clinic, for counseling young people, (2) certain hours or days of the week at the clinic set aside for young people, and (3) "hot lines"—telephone counseling services—so that young people too shy to come to a clinic can still obtain information and advice.

The Hong Kong Family Planning Association has made a concerted effort to adapt its program to young people of fertile age. In 1977 the Association set up the Youth Advisory Service (YAS) to counsel unmarried young men and women. The YAS has its own inquiry counter, waiting area, and counseling rooms, offering extra privacy. The number of counseling visits increased from 1,433 in 1981 to 4,308 in 1983. Almost all of the clients are unmarried women who are already sexually active. One in 10 is younger than age 16. Most receive counseling and referral to the family planning clinic. Some are referred to government agencies for special health or social services as needed. YAS counselors publicize YAS services by appearing on television talk shows and by lecturing in schools and social agencies (194, 195). Special counseling centers for young people also have been set up by the Asociación Dominicana Pro-Bienestar de la Familia (PROFAMILIA) of the Dominican Republic (45) and the Asociación Demográfica Costarricense (ADC) of Costa Rica (44).

Many family planning organizations do not have the space or personnel to maintain separate facilities for young people. Instead, they set aside special times when the clinic and counseling services are open only to young people. In Barbados, for example, the Family Planning Association offers services two afternoons per week to young people, particularly to young pregnant women and young mothers (57). In Suriname, Stichting Lobi holds a weekly "youth hour," when young people can come to the clinic and talk with staff (664). In Ciudad Juarez, Mexico, Centros Materno Infantil y de Planificación Familiar runs a special counseling service for young people two hours per day, six days per week. Over 700 young people were counseled in 1984 (533).

Some young people may be too uncomfortable to go to a family planning clinic even during "youth hours" or may not be able to reach the clinic then. In urban areas telephone counseling is a way to provide information to these young people. Family planning organizations have set up telephone hot lines in a number of countries, including Austria, Hong Kong, Ireland, Mauritius, Mexico, the Netherlands, the Philippines, Sierra Leone, Thailand, and the US (194, 195, 257, 325, 327, 330, 556, 557, 560, 580, 607). These services have proved to be very popular. In 1984 the youth hot line in Hong Kong received an average of 31 calls a day (196). In Bangkok, Thailand, a hot line set up by the Youth-to-Youth Project of the Population and Community Development Association received about 15,000 calls between its start, in 1980, and 1985 (556). In Hong Kong and the Philippines, it is reported, about 45 percent of callers are male (195, 606).

Maintaining hot lines can be difficult and expensive. Frequent advertising may be necessary to let young people know about the service (557). Training and paying counselors is expensive, particularly since most hot lines operate 10 or more hours per day. Programs in the Philippines, Hong Kong, and the US minimize costs by using trained youth volunteers (195, 317, 327).

Family Planning Clinics for Young People

Special clinics or centers provide family planning counseling and services for sexually active young people in the US, in many European countries, and in other countries including Brazil, Indonesia, Israel, the Philippines, and

Thailand (145, 153, 327, 351, 352, 410, 557, 560, 631, 684). In Brazil two family planning clinics affiliated with maternity hospitals serve young women immediately after childbirth or treatment for complications of illegal abortion, when another pregnancy would pose especially serious health risks. The first clinic designed particularly for women 19 and younger opened in the Tsylla Balbino Maternity Hospital in Salvador, Bahia State, in 1982. Young women can receive counseling and contraceptives at the clinic before leaving the hospital, and they can return in 30 days for a complete gynecological examination and a new supply of contraceptives. The Tsylla Balbino clinic has been so successful that patients older than 19 have asked to attend. In the first nine months of operation, 1,607 new clients came to the clinic, and 1,313 returned for follow-up visits (153).

The success of the Tsylla Balbino clinic led Encruzilhada Maternity Hospital in Recife, Brazil, to open a special clinic for adolescents in late 1983. In the first 15 months of operation, there were 1,418 visits by new clients and 2,674 follow-up visits (534).

Other centers serve all young people in the community, not just young women who have recently been pregnant. In Thailand the Planned Parenthood Association of Thailand maintains a youth counseling center in a poor area of Bangkok. The center offers telephone and in-person counseling and provides contraceptives to in-school and out-of-school youth. Almost 20,000 clients visited the center for counseling in 1982, and more than 27,000 in 1983 (334, 560).

In Israel the Open Door Counseling Centres and the SHILO Pregnancy Advisory Services offer sex education and contraceptive services to young people. These services are not readily available to Israeli young people otherwise. While parental consent is not required for abortion, it is required before an adolescent can buy prescription drugs. Thus many doctors are reluctant to prescribe contraceptives for young women (684). At the same time, however, these women are at especially high risk of unwanted pregnancies. In Israel, as in a number of other countries, military service means that young people leave their homes, often for the first time, and enter an unfamiliar, challenging environment with little preparation (684). In this context the youth centers fill a vital need for education as well as services. The Open Door Centres offer free counseling and maintain a library of books, journals, films, and audio tape cassettes. In two years about 3,200 clients have visited the centers. In contrast to many other family planning clinics, which are attended almost exclusively by women, over 10 percent of the Open Door Centres' clients are men, and about 20 percent, couples (684).

Open house or drop-in clinics that require no appointments are operating in the US and in a number of European countries including Belgium, France, Italy, the Netherlands, Poland, Sweden, and the UK (103, 327, 352, 463, 622). These clinics are open in late afternoons and evenings when most young people have finished school or work. Staff often are specially trained to work with young people. Clients pay a small fee or receive services free of charge. While most youth clinics offer some medical services, especially gynecological care, they focus on counseling and family life education. The Brook Advisory Centres in the UK, for example, have an extensive information and education program. In the first nine months of 1983 the Centres distributed 31,000 publications for young people on a wide range of subjects such as STDs, contraception, and maturation during adolescence (85). In 1984 almost 20,000 young men and women under age 20 visited the Centres for counseling and services (86).

"Do you want to plan your family? Call us. We can tell you where you can get help," offers this Mexican poster. Telephone hot lines help young men and women who cannot reach counseling offices and those who are too shy to meet face-to-face with counselors.

A number of youth clinics carry out extensive educational programs in youth clubs and in schools. In Belgium, for example, the staff of the Aimer Jeunes clinic gave sex education lectures to about 7,000 young people in 1980. In addition, about 1,000 sexually active young women obtained contraceptive services, and about 500 young men and women obtained treatment for STDs (410). In the Netherlands, Rutgers Stichting, a family planning association, works closely with both primary and secondary schools. The association trains teachers to conduct family life education in their schools (327).

Meeting the needs of young people for guidance in sexual behavior and responsible parenthood is no easy task. Simply warning them about the dangers of premature sexual involvement and parenthood has proved insufficient. Young people today, like their elders, need to know how they individually can benefit from planning their lives and families to achieve their objectives. The basic goal of all youth programs is to help young people achieve their full potential in life—through more education, satisfying employment, good health, and a responsible family life.

Table 10. Family Planning Methods: Advantages and Disadvantages for Young People

Method	Effectiveness: Best Observed	Effectiveness: In Typical Users	Advantages	Disadvantages
Oral contraceptives	Estrogen-progestin: 99% Progestin-only "minipill": 99%	97–98% 96–97%	Easy to use Highly effective in preventing pregnancy Does not interfere with coitus Regulates menstrual cycle, reduces heavy bleeding and menstrual pain Helps protect against some STDs Helps protect against ovarian and endometrial cancer	Must be taken every day May require medical examination and prescription Minor side effects—nausea, menstrual spotting in some women Fear of circulatory and other problems, although very rare in young women, may discourage regular use
Condoms	98%	80–90%	Easy to use Inexpensive and easy to obtain No health risks Very effective protection against some STDS Men share responsibility for family planning	Must be put on just before every coitus Some men complain of decreased sensation Associated by some people with prostitution
Diaphragm	97–98%	80–90%	No health risks Helps protect against some STDs and cervical cancer	Must be inserted with jelly or foam before every coitus and left in place for at least 6 hours afterwards Fitting by medical personnel needed Some women may find it awkward or embarrassing to use May be inconvenient to clean, store, and carry
Spermicide	97–98%	80–90%	No health risks Helps protect against some STDs	Must be inserted 5–30 minutes before every coitus Effective for only 30–60 minutes Some women may find them awkward or embarrassing to use
Sponge	90%	75–90%	Continuous protection for 24 hours Effective immediately after insertion May help protect against some STDs	Must be moistened before insertion Some women may find it awkward or embarrassing to use May cause vaginal irritation in some users Sometimes difficult to insert and remove Relatively expensive
Intrauterine device (IUD)	99%	95–98%	Easy to use Highly effective in preventing pregnancy Does not interfere with coitus Repeated action not needed	Increases risk of PID and infertility in women with more than one sexual partner (for this reason, not usually recommended for young, nulliparous women) Must be inserted by health personnel May cause heavy bleeding and pain in some women
Natural Family Planning	94–98%	75–85%	No supplies needed No side effects Men share responsibility for family planning Women learn about their bodies	Difficult to use, especially if menstrual cycles are irregular, as is common in young women Abstinence may be necessary for long periods Lengthy instruction and ongoing counseling may be needed
Calendar rhythm	85%	70–80%	No supplies needed No side effects Men share responsibility for family planning	Difficult to use, especially if menstrual cycles are irregular, as is common in young women Abstinence may be necessary for long periods
Withdrawal	85%	75–80%	No supplies or advance preparation needed No side effects Men share responsibility for family planning	Interferes with coitus May be difficult to use effectively

Sources: Hatcher et al. (286); Kols et al. (387); Liskin & Fox (418); Rinehart (583); Sherris et al. (629); Sherris et al. (630).

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Population Reports

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Number 5
March–April 1986

ISSUES IN WORLD HEALTH

Population Information Program, The Johns Hopkins University, Hampton House, 624 North Broadway, Baltimore, Maryland 21205, USA

Immunizing the World's Children

Editors' Summary. Immunization against the most common and deadly childhood diseases saves the lives of some one million children in developing countries each year. But more than 3.5 million others are killed or disabled by diseases that immunization could have prevented. Fewer than half of one-year-olds have been immunized against the major preventable diseases. Concerted efforts are now underway to expand immunization services to all the world's infants and pregnant women by 1990.

The World Health Organization (WHO) Expanded Program on Immunization (EPI) focuses on six diseases:

- **Measles** affects nearly all unimmunized children and kills over two million children annually.
- **Pertussis** (whooping cough) kills some 600,000 children each year and affects millions more.
- **Neonatal tetanus**, contracted through contamination of the umbilical cord at birth, kills at least 800,000 each year.
- **Polio** is the major cause of lameness in the developing world and each year kills about 30,000.
- **Tuberculosis**, which each year attacks 10 million, can be especially severe in young children.
- **Diphtheria** is less common but kills 10 to 15 percent of its victims.

Immunization against these diseases is safe and effective. Decades of experience in developed countries and a variety of evidence from Africa, Asia, and Latin America show that sickness and death from these diseases fall sharply where immunization is widely available.

The challenge is to deliver the basic vaccines to all infants and tetanus toxoid to all pregnant women. Programs have been able to immunize an infant fully for as little as $5–$15 (US), but many programs reach less than half of the population at risk.

Most programs start by offering immunizations at fixed health posts. Outreach and mobile services that set up temporary vaccination points in the community are often needed as well. Also, intensive campaigns have immunized many children quickly. For example, special vaccination days, widely publicized by mass media and even door-to-door visits, have proved effective in such varied countries as Brazil, Burkina Faso, Colombia, Ecuador, and Turkey. Whether such campaigns encourage the development of long-term, continuing immunization services is much debated. Even without campaigns, persuasive communication efforts are necessary.

A major logistical problem is keeping vaccines cold to protect their potency. Careless handling, a broken refrigerator, or electrical failure can break the cold chain and leave children unprotected.

Comprehensive evaluations show that immunization programs face common problems. The chief weaknesses are limited surveillance of disease cases and immunization coverage, inadequate supervision, and insufficient communication efforts. Nonetheless, many programs have expanded coverage greatly in the last decade. In some countries sickness and death rates have dropped sharply. Like family planning and other basic health measures, immunization programs can succeed when there is planning, commitment, skill, and persistence at every level.

End of Editors' Summary.

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BACKGROUND

Immunization programs can greatly reduce the incidence of many infectious diseases. In just 10 years an intensive worldwide vaccination and surveillance campaign eradicated smallpox, for centuries one of the most feared human diseases. In many developed countries, where immunization is routine and nearly universal, serious childhood diseases such as measles, polio, diphtheria, and whooping cough are now rare. Furthermore, in some developing countries extensive immunization programs have shown dramatic results in just a few years, and disease rates are dropping (see Figure 1). Immunization at current levels in developing countries is estimated to save nearly one million children's lives each year (135).

At the same time, however, at most 40 percent of children in the developing world (excluding China) are protected against diphtheria, tetanus, pertussis (whooping cough), and polio, and only about 20 to 30 percent are protected against measles (see Table 1). Each year these diseases, which can easily be prevented, kill or permanently handicap over three million children (568). To prevent these unnecessary deaths and disabilities, accelerated immunization efforts are underway throughout the world. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have established the goal of making immunizations against six major diseases available to all of the world's children by 1990 (135, 538). Family planning programs and immunization programs together can probably reduce infant and child mortality in some countries by 25 to 50 percent.

History of Vaccine Development

The vaccine era began in 1796, when Edward Jenner, an English country doctor, inoculated an 8-year-old boy with material from a cowpox lesion and later showed that the boy was protected against smallpox. Jenner tried the experiment because he had observed that milkmaids, who frequently developed cowpox lesions on their hands, rarely developed smallpox. In 1798, after repeating the experiment a number of times with identical results, Jenner published his findings. He coined the term "vaccine" from the Latin *vaccinus*, meaning "of cows" (100, 177, 222). By 1810 compulsory vaccination had been instituted in many European countries (120, 177).

Almost 100 years after Jenner's discovery, Louis Pasteur found that other immunizing agents could be produced by inactivating the microbes that caused infectious diseases. In honor of Jenner's work, Pasteur continued to use the term vaccine for all these agents. In 1885, after testing a vaccine of inactivated rabies virus in animals, Pasteur used the vaccine on a 9-year-old boy. The boy, who had been severely bitten by a rabid dog and faced certain death, received 14 injections of the vaccine. He did not develop rabies. By 1890 there were rabies vaccination centers in major cities throughout the world (132, 421).

Throughout the 20th century other vaccines were developed, and mass immunization campaigns proved successful. In 1921 Albert Calmette and Camille Guerin produced an attenuated strain of the bacterium that causes tuberculosis, thus developing the BCG (bacillus Calmette-Guerin) vaccine. Mass vaccination with BCG was quickly started in many countries. By 1955 some 60 million people had received BCG vaccinations (120). In 1923 Gaston Ramon discovered that the bacterial toxins responsible for tetanus and diphtheria could be inactivated with formaldehyde (they are then called toxoids) and used to protect against these diseases. In 1925 a vaccine against pertussis was developed, and in the 1930s, a vaccine against yellow fever. In the 1940s some 20 million West Africans were vaccinated against yellow fever, and the disease was largely controlled in this area (132). In the 1950s two vaccines against polio were tested—an injectable vaccine using killed virus, popularly known as the Salk vaccine, and an oral vaccine using live attenuated virus, known as the Sabin vaccine. Much of the developed world and some developing countries are now largely free of polio because of nearly universal vaccination against the disease.

At present, vaccines that produce active immunity—that is, an active response to the vaccine by the body's immune system—are available for about 20 infectious diseases. Many of these vaccines are widely used, including measles, polio, BCG, and DPT (diphtheria, pertussis, and tetanus, commonly given together in one injection). These are the vaccines that WHO and UNICEF intend to make universally available by 1990. The yellow fever vaccine is given

Dedicated to
Ryan T.J. Lau
Beloved son of Jacqueline D. Sherris
and Joseph T.Y. Lau
February 19, 1984 – April 7, 1986

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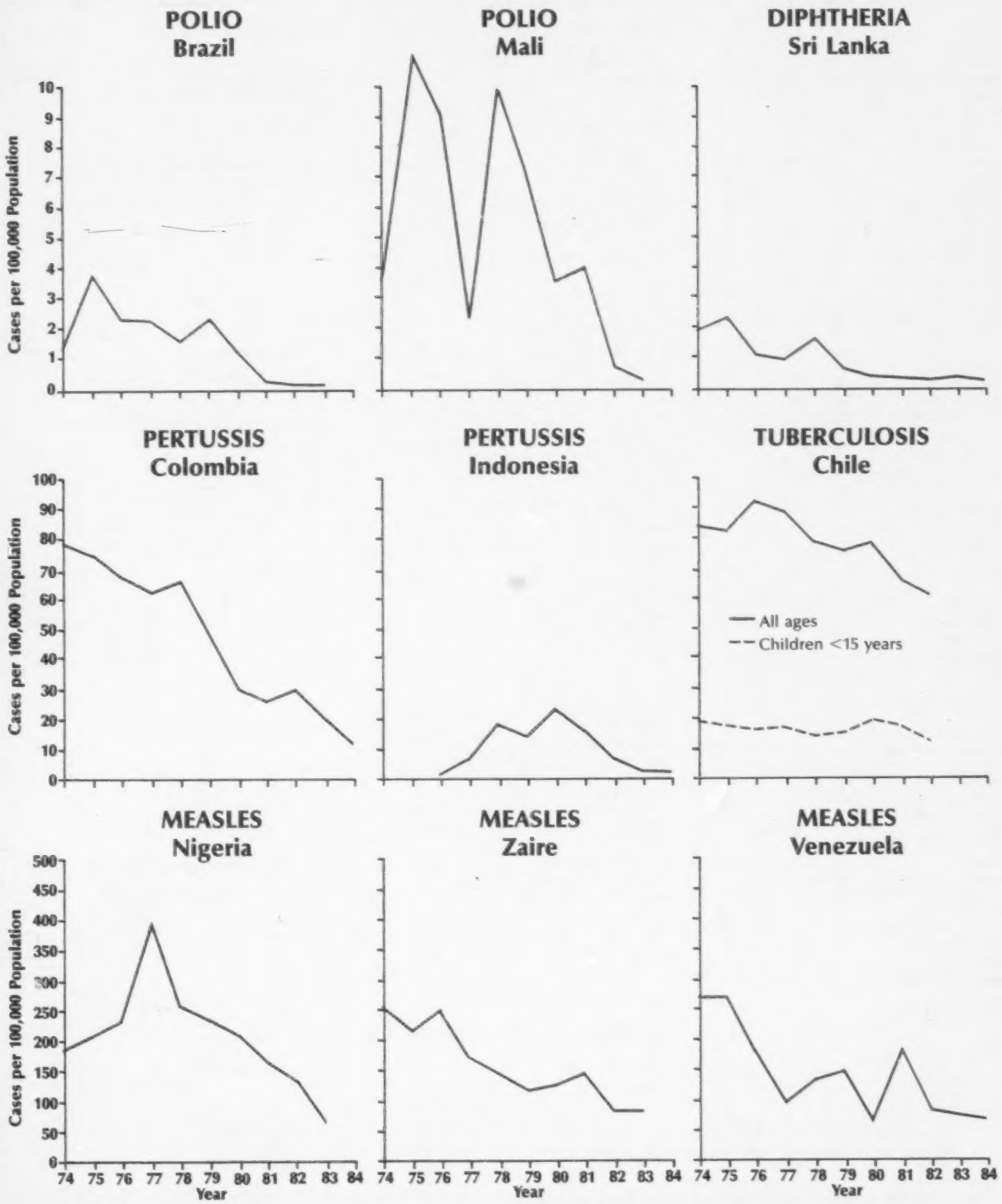
Phyllis T. Piotrow, Ph.D., Director, Population Information Program; Walter W. Stender, Associate Director; Ward Rinehart, Editor and Associate Director.

Figure 1. Incidence of Selected Vaccine-Preventable Diseases, Selected Countries, 1974–1984



Source: based on numbers of cases from WHO (590) and populations from United Nations (416), except Chile, rates from Chile and PAHO (67).

Rates of vaccine-preventable diseases declined dramatically between 1974 and 1984 in a number of countries, as shown above. The scales of the graphs are different in each row because some diseases, such as measles, are much more common than others, such as diphtheria. Trends for some diseases show the impact of epidemics—for example, polio in Mali and measles in Venezuela. Some apparent increases, such as of pertussis in Indonesia in the late 1970s, may partly or entirely reflect improving case reporting rather than real increases.

Table 1. Estimated Immunization Coverage, Selected Countries and World Regions, 1981–1985

Region, Country & Year Data Reported	% of Children Fully Immunized by Age One[a] BCG	DPT	Polio	Measles
AFRICA				
Algeria 1981	59	33	30	17
Angola 1983	25	6	NA	26[b]
Burkina Faso 1981	16	2	2	23
Cameroon 1981 & 1983	8	9	5	16
Ethiopia 1984	11	7	7	8
Gabon 1983	NA	14	NA	NA
Gambia 1984	98	70	77	79
Ghana 1983	31	19	17	1
Kenya 1983	76	58	57	55
Lesotho 1984	98	69	64	63
Madagascar 1981	13	20	3	NA
Malawi 1985	74	58	56	52
Mali 1981	19	NA	NA	NA
Mozambique 1982	40	16	16	22
Niger 1981	28	6	6	19
Nigeria 1981	23	24[c]	24[c]	55(20[c])
Rwanda 1983	60	36	25	53
Sierra Leone 1984	80	21	22	66
Swaziland 1983	93	59	59	49
Tanzania 1984	73	52	49	63
Uganda 1981	18	14	8	22
Zaire 1981	34	16	18	20
Zambia 1984	82	49	47	56
Zimbabwe 1984	87	66	61	53
Number of countries reporting	*33*	*36*	*31*	*31*
Regional coverage, reporting countries only[d]	37	26	25	28
Regional coverage (47 countries), counting nonreporting countries as zero coverage	32	17	15	31
AMERICAS (DEVELOPING COUNTRIES)				
Argentina 1983	64	65	64	62
Belize 1984	77	54	54	44
Bolivia 1984	23	6	46	20
Brazil 1984	75	67	89[e]	80[b]
Chile 1984	87	84	86	77
Colombia 1982 & 1984	68	60	61	53
Costa Rica 1984	85	82	81	83[b]
Cuba 1983 & 1984	96	85	99[e]	71
Dominican Rep. 1983 & 1984	43	20	22	19[b]
Ecuador 1982 & 1984	99	48	47	54[b]
El Salvador 1984	25	53	52[e]	50[b]
Guatemala 1984	33	47	46[e]	24
Haiti 1984	69	13	13	8
Honduras 1982 & 1984	48	48	85	52[b]
Mexico 1984	25	52	49	NA
Nicaragua 1984	98	33	77	27
Paraguay 1982 & 1984	80	67	68	62
Peru 1982 & 1984	63	28	28	64[b]
Uruguay 1983 & 1984	95	63	82[e]	19[b]
Venezuela 1984	23	21	44	19
Number of countries reporting	*30*	*40*	*40*	*38*
Regional coverage, reporting countries only[d]	57	54	63	59
Regional coverage (45 countries), counting nonreporting countries as zero coverage	56	54	62	45

Region, Country & Year Data Reported	% of Children Fully Immunized by Age One[a] BCG	DPT	Polio	Measles
EASTERN MEDITERRANEAN				
Afghanistan 1984	11	16	16	13
Bahrain 1984	NA	80	80	65
Egypt 1984	53	57	67	41
Iran 1984	10	68	65	69
Iraq 1985	60	63	63	25
Pakistan 1984	55	44	44	33
Saudi Arabia 1985	88	81	81	77
Somalia 1984	17	11	11	17
Sudan 1984	7	4	4	3
Syria 1984	43	22	22	20
Tunisia 1984	76	61	61	55
United Arab Emirates 1984	59	61	63	66
Yemen Arab Rep. 1984	25	9	7	11
Number of countries reporting	*21*	*23*	*23*	*23*
Regional coverage, reporting countries only[d]	40	46	47	38
Regional coverage (23 countries), counting nonreporting countries as zero coverage	39	46	47	38
EUROPE (DEVELOPING COUNTRIES)				
Morocco 1984	70	48	48	42
Turkey 1983	65	56	59	30
Number of countries reporting	*3*	*3*	*3*	*3*
Regional coverage, reporting countries only[d]	43	54	56	37
Regional coverage (3 countries), counting nonreporting countries as zero coverage	43	54	56	37
SOUTH EAST ASIA				
Bangladesh 1984	2	2	1	1
Burma 1984	25	8	2	NA
Korea, D.P.R. 1984	93	91	91	NA
India 1984	65	51	37	NA
Indonesia 1984	56	6[f]	7	7
Nepal 1984	57	26	5	23
Sri Lanka 1984	68	67	66	2
Thailand 1984	81	57	56	7
Number of countries reporting	*11*	*11*	*11*	*7*
Regional coverage, reporting countries only[d]	58	40	29	7
Regional coverage (11 countries), counting nonreporting countries as zero coverage	58	40	29	2
WESTERN PACIFIC (DEVELOPING COUNTRIES)				
China 1984	50	63	78	74
Hong Kong 1984	96	86	91	NA
Malaysia 1984	96	43	45	NA

Region, Country & Year Data Reported	% of Children Fully Immunized by Age One[a] BCG	DPT	Polio	Measles
Papua New Guinea 1984	67	34	32	24
Philippines 1983	76	61	58	30
Korea, Rep. of 1983	84	69	78	NA
Singapore 1983 & 1984	74	76	79	92
Viet Nam 1983	5	4	2	4
Number of countries reporting	*24*	*24*	*25*	*15*
Regional coverage, reporting countries only[d]	51	59	71	66
Regional coverage (29 countries), counting nonreporting countries as zero coverage	50	58	70	61
DEVELOPED COUNTRIES				
Austria 1983 & 1984	90	90	90	25[b]
Belgium 1984	NA	95	95	NA
Czechoslovakia 1984	99	99	98	99[b]
Denmark 1983 & 1984	85	94	94	NA
Finland 1983	90	94	78	81[b]
France 1983 & 1984	96	94	97	25
German Fed. Rep. 1981	40	50	80	35[b]
Greece 1983 & 1984	56	60	98	70
Hungary 1984	99	99	98	99[b]
Italy 1983 & 1984	NA	92[g]	90	5
Japan 1982	90	81	95[e]	66[b]
Netherlands 1984	NA	97	97	92[b]
New Zealand 1983	18	73	72	NA
Norway 1984	90	90	90	80
Portugal 1984	76	94	74	46[b]
Spain 1984	NA	95	91	38
Sweden 1983	31	99[g]	99	87[b]
United Kingdom 1983	74	55	83	58[b]
United States 1982	NA	97[h]	98[h]	96[b](98[h])
USSR 1981 & 1984	91	89	90	95[b]
Yugoslavia 1983	85	85	85	95[b]
Number of countries reporting	*23*	*30*	*30*	*27*
Coverage for developed countries, reporting countries only[d]	86	86	92	78
Coverage for developed countries (39 countries), counting nonreporting countries as zero coverage	56	62	66	74
SUMMARY—REPORTING COUNTRIES ONLY				
Developing countries	50	45	46	44
Developing countries excluding China	50	41	37	31
Developed countries	86	86	92	78
World	54	50	51	50
SUMMARY—ALL COUNTRIES				
Developing countries	49	43	43	32
Developing countries (excluding China)	48	38	34	21
Developed countries	56	62	66	74
World	50	46	47	38

0 = < 0.5 NA = not available

[a] Based on number of infants surviving to one year of age in 1984
[b] Immunization at 12-60 months of age
[c] Reported by UNICEF field office (135)
[d] Immunization coverage levels for only those countries in region reporting to WHO plus Nigeria and United States. Data reported by all countries are included, even though not all are listed.
[e] Two doses only
[f] Coverage based on 3-dose schedule, first implemented in 1984-85
[g] DT only
[h] Coverage for children age 5-6 entering first grade in 1984 (637)

Source: All data from WHO (589, 591) except for Nigeria (135) and United States (637)

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to people living in or traveling to endemic areas. In some regions cholera and typhoid vaccines also are widely used although they are relatively ineffective and often produce side effects. Vaccines against meningococcal disease and Japanese B encephalitis are widely used in some areas. Mumps and rubella vaccines are widely used in developed countries but not yet in developing areas, partly because of their cost.

The Expanded Program on Immunization

In 1974 WHO established the Expanded Program on Immunization (EPI). In 1977 EPI set three long-term objectives:

- to reduce morbidity and mortality from six major diseases—diphtheria, pertussis, tetanus, measles, polio, and tuberculosis—by immunizing all children throughout the world by 1990,
- to promote national self-reliance in delivering immunization services within comprehensive health services, and
- to promote regional self-reliance in vaccine production and quality control (538).

EPI has built upon the work of the successful smallpox eradication program (see pp. L-172–173). The program has been endorsed by all member states of WHO. UNICEF is an active participant in EPI, providing vaccines, training, cold chain equipment, and other support to national programs (537).

Although much remains to be done, EPI has made important progress toward the goal of universal immunization in developing countries. The 1985 coverage rates for the developing world excluding China are about 50 percent for BCG, about 40 percent for DPT, about 35 percent for polio, and between 20 and 30 percent for measles (see Table 1). These rates are substantial improvements over coverage rates in 1974, estimated at less than 5 percent for all vaccines other than smallpox and perhaps BCG (162, 448). A number of countries, including Burkina Faso, Pakistan, and Turkey, have dramatically increased coverage in the past few years through such strategies as special outreach programs, mass communication efforts, and nationwide vaccination days (42, 53, 511).

Immunization programs are preventing much sickness and saving many lives in developing countries. For example, West African immunization campaigns against measles saved an estimated 170,000 lives annually (120). In Sri Lanka immunization lowered neonatal tetanus deaths to one-tenth of previous levels (92, 555). And in Brazil polio rates have dropped to less than 0.06 per 100,000 thanks to twice-yearly vaccination days (364, 590).

To speed up EPI activities, in 1985 WHO and UNICEF recommended five specific areas for immediate action:

- Provide immunization or information about immunization at every health contact,

EPI Recommended Vaccination Schedule

Age	Vaccine
Birth	BCG, oral polio
6 weeks	DPT, oral polio
10 weeks	DPT, oral polio
14 weeks	DPT, oral polio
9 months	Measles

Mothers in Thailand wait for their babies to be vaccinated. The Expanded Program on Immunization seeks to make immunization against six diseases available to all by 1990. (Nikomrat/UNICEF)

- Reduce dropout rates between the first and last immunizations,
- Increase the priority given to control of measles, polio, and neonatal tetanus,
- Improve immunization services to the poor in urban areas,
- Use special approaches, such as national immunization days, where they strengthen the health infrastructure and contribute to a sustained improvement in coverage (518, 568).

As countries have gained experience with large-scale immunization programs, it has become clear that immunization, like family planning and other health programs, requires adequate political and financial support, effective management, and good communication with the whole population. The technology exists: effective, inexpensive vaccines are readily available in most areas through local manufacturers or donor agencies. The major challenge is building a system that will deliver vaccines—eventually to protect all the children born every year. This involves building and sustaining the means to transport vaccines safely throughout a country, to train and supervise all program personnel, to reach all families with susceptible children, and to monitor the progress of programs and the pattern of disease incidence, using these findings to improve program operations. An important part of the challenge to immunization programs, as to family planning and other preventive health care programs, is persuading people to plan ahead and take appropriate preventive health measures.

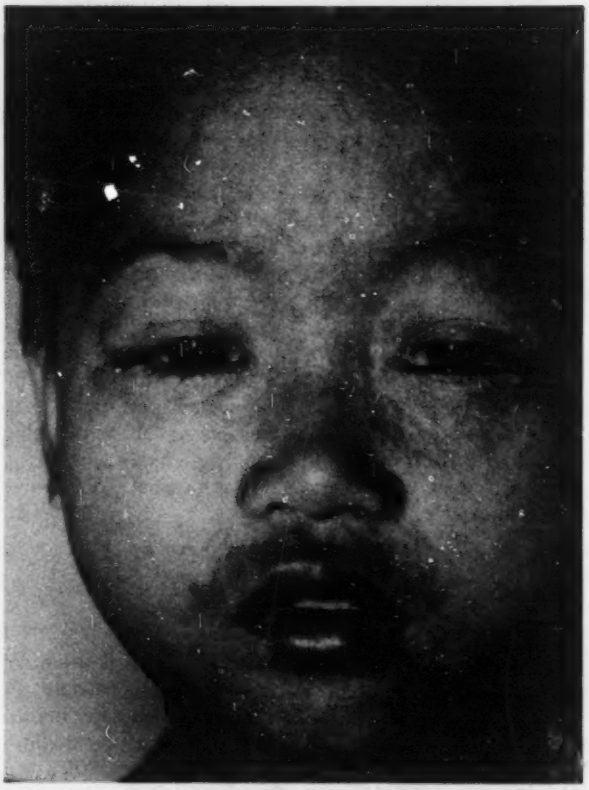
MEASLES

Of the vaccine-preventable diseases, measles is the most important cause of childhood morbidity and mortality in developing countries. Nearly every child who is not immunized contracts measles, and currently over two million die from the disease each year, many of them in Africa and Latin America (119, 250, 568). Despite this toll, many people, including some health personnel, underestimate the importance of measles, considering it a mild, routine childhood illness (5).

Measles begins with fever, malaise, cough, and runny nose. Within three to seven days the characteristic blotchy rash appears, beginning on the face and then spreading all over the body. The rash lasts from four to seven days and sometimes ends with fine peeling of the skin. Koplik spots (greyish-white spots with red borders) often appear on the inside of the cheek at about the time the rash begins. These spots are important to diagnosis since they occur only in measles. Relatively common complications of measles include ear infections, pneumonia, and diarrhea. Rarer complications include blindness and encephalitis (inflammation of the brain). Complications are more common and more severe among very young infants, among malnourished children, where health care is limited, and possibly in crowded conditions (11, 36, 404).

Caused by a virus, measles spreads easily and rapidly. There is no available treatment. Because it is so contagious, WHO estimates that in countries with no immunization programs at least 90 percent of the population will contract measles (571). Data from a 1979 measles epidemic in a largely unimmunized population in rural Somalia show how the disease can spread. About 23 of every 1,000 people in affected villages contracted measles. About two-thirds of cases were children one to four years old. In these age groups the incidence ranged from about 62 to 98 per 1,000 (468).

Mortality from measles is highest among young children. In Brazil between 1974 and 1980, for example, over 40 percent of measles deaths were of children under age one, even though this group accounted for only about 10 percent of reported cases. Children under age five accounted for over 90 percent of all measles deaths but only about one-half of reported cases (361). In the 1970s reported case-fatality rates among young children in developing countries ranged from about 5 percent of those under age four in an Indonesian district to 25 percent of those under age three during a severe outbreak in Guinea Bissau (11, 507, 508).



Measles is the foremost killer among vaccine-preventable diseases. Nearly all unimmunized children contract it, and some two million die annually. Complications, such as diarrhea and pneumonia, are common, especially in infants. (WHO)

Measles is therefore a major cause of childhood death. In Nairobi, Kenya, between 1960 and 1965, before any immunization program was set up, measles caused nearly one-fourth of all deaths among children under age seven (151). In India measles causes about 10 percent of deaths among preschoolers (190).

Severely malnourished children probably develop more severe cases of measles. These children also may be more likely to die (122). In Africa, for instance, the case-fatality rate of severely malnourished children with measles has been estimated at 25 to 50 percent (8). This may be partly because malnourished children tend to have a less effective immune response. Thus measles symptoms are more severe, and secondary infections leading to such complications as pneumonia and diarrhea are more likely (8, 436, 437).

At the same time, measles may contribute to malnutrition. A Nigerian study found that 25 percent of children with measles lost over 10 percent of their body weight (5, 251). A study in Bangladesh found that in children age four or younger those who had measles with prolonged diarrhea weighed less than average for their height (206). A recent study of 595 Haitian infants also suggests a link between measles and malnutrition. Among infants 6 to 12 months old, those who had had measles had significantly poorer nutritional status (as measured by weight for age, weight for length, and/or length for age) than those who had not had measles (147).

Measles-related diarrhea is an important factor in the interaction between measles and malnutrition. Measles in young children is frequently linked with episodes of severe diarrhea, sometimes lasting for several months (111, 112). An estimated 6 to 26 percent of diarrhea-related deaths in children under age five could be prevented by extensive measles immunization programs (112).

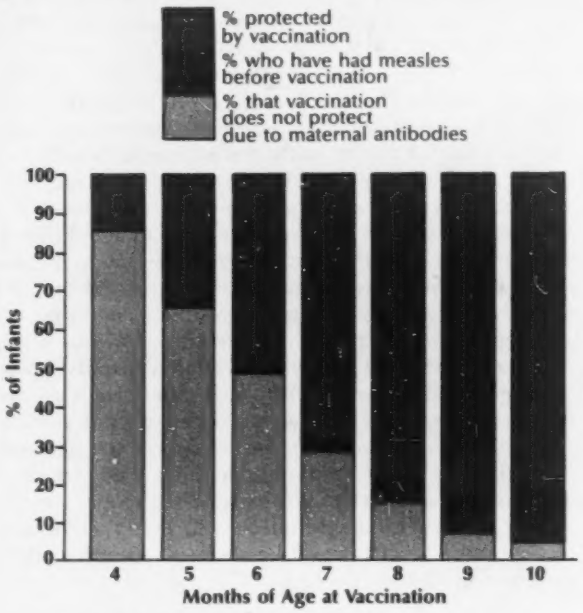
Measles Vaccine

The measles vaccine currently in use is a live, "further attenuated" virus vaccine. "Attenuated" means that the wild microbe has been slightly weakened so that it produces few, if any, symptoms of disease but still stimulates an immune response. The first live measles vaccines, used in the early 1960s, produced high rates of side effects and so were further attenuated (36, 71).

Measles vaccination saves lives. For instance, in West Africa in the late 1960s it was estimated that vaccination campaigns halved the number of measles cases and prevented about 170,000 deaths each year (120). During a measles epidemic in six South Indian villages in the late 1970s, none of 121 immunized children developed measles, but nearly one-fourth of almost 1,000 unimmunized children did, and about 7 percent of cases died. The case-fatality rate was highest—14 percent—in the village with no access to health care (191).

One dose of measles vaccine can produce permanent immunity. The vaccine does not work in very young in-

Figure 2. Impact of Measles Vaccination at Various Ages Between 4 and 10 Months, Kenya, 1974–1981



Source: adapted from WHO (558)

WHO recommends nine months of age as the best time to immunize children against measles. Data from Kenya show that at nine months the percentage protected by vaccination was greatest because only 10 percent had had measles and only 7 percent still had maternal antibodies, which make vaccination ineffective.

fants, however, since persisting maternal antibodies interfere with the immune response (87). In most developed countries measles vaccine is given at about 15 months. By then all maternal antibodies have disappeared (385, 639, 642). About 95 percent of children vaccinated at this age develop immunity to measles (36).

In developing countries giving measles vaccine at 15 months often is too late. Infants in many developing areas frequently lose maternal antibodies against measles sooner, generally between 7 and 10 months (141). Why this is so is unclear. Since exposure to measles is so common, infants in these areas often contract measles as soon as maternal antibodies are lost. For instance, a serological study of Haitian infants found that 34 percent had evidence of measles infection by 11 months (147). The likelihood of very young children contracting measles is especially high in poorer, crowded areas.

Studies from a number of African, Latin American, and Asian countries suggest that in these areas the optimum age for measles vaccination is about nine months (141, 166, 214, 244, 245, 508, 558, 544). At that age, the vaccine produces immunity in 80 to 90 percent of children. At the same time, few children have yet contracted measles (see Figure 2). Work is progressing on a new measles vaccine that could protect younger children. A recent study in The Gambia found that administering one strain of measles vaccine subcutaneously or intradermally protected children as young as four to six months old, presumably before maternal antibodies had disappeared (438). A vaccine that could be given to younger children would be easier to deliver since younger infants tend to have more contact with health facilities. Nine months is a particularly awkward age since children often are too heavy to be carried to vaccination sites, but they cannot yet walk (159).

Measles vaccine is very safe. Parents should be warned, however, that about 30 percent of those vaccinated develop malaise, mild fever, and/or a rash 4 to 10 days after vaccination (36). Severe complications are very rare. Convulsions have occurred in 0.02 to 190 of every 100,000 vaccinated individuals, compared with 500 to 1,000 per 100,000 measles cases. Encephalitis has been observed in 0.1 per 100,000 vaccinated individuals, compared with 50 to 400 per 100,000 measles cases (501, 601). There appears to be no significant increase in side effects or reduction in immune response among children who are malnourished or ill when vaccinated (141). Children should be vaccinated even if they are malnourished or ill.

PERTUSSIS

Among vaccine-preventable diseases, pertussis—commonly called whooping cough—is second only to measles as a cause of serious childhood illness in developing countries (110). It is estimated that currently over 600,000 children die from pertussis each year (568).

Pertussis is an exhausting illness that can last for several months. It begins with mild upper respiratory symptoms like those of a common cold. Within one or two weeks coughing attacks start—attacks that often end with a whooping sound during inhalation. Severe attacks often lead to vomiting. Coughing attacks become more frequent and more severe for two to four weeks and then gradually diminish over another one to two weeks. A residual cough may last for several months. Complications of pertussis include pneumonia and other respiratory infections. Complications related to the severe coughing attacks range from broken blood vessels in the eyes to umbilical or inguinal hernias. Lack of oxygen and/or increased blood pressure during coughing attacks can lead to central nervous system disorders such as convulsions, coma, and encephalitis, all of which occasionally result in permanent damage (65, 254, 404). Also, the prolonged coughing attacks and associated vomiting may lead to severe undernutrition (122).

Caused by the bacteria *Bordetella pertussis*, pertussis spreads easily and generally does not respond well to treatment. It is estimated that up to 80 percent of susceptible children exposed to pertussis will contract it (110). The accepted treatment is the antibiotic erythromycin. Erythromycin may stop the disease from developing in a person who has been exposed but has not yet developed symptoms. In a person who has contracted pertussis, however, the drug does little to alleviate symptoms, but it does reduce the length of time that a person is contagious (404). In many developing areas few children are treated, however, in part because health care is not available but also because pertussis often is difficult to diagnose, particularly in very young children.

Like mortality from measles, mortality from pertussis is high in developing countries for four main reasons:

- Because immunization levels are low (see Table 1) and because social patterns and/or living conditions allow rapid transmission, most children contract the disease.

- Children often contract pertussis after they already are weakened by other infections and/or malnutrition.
- Children often get pertussis at a very early age, when they are most vulnerable to complications.
- Basic supportive health care often is not available to sick children (253, 254).

A 2-year study in Kenya found that 90 percent of pertussis cases involved children age six years or younger, with a median age of 3½ years. The attack rate was highest in infants under one year—16 percent. The case-fatality rate in infants was 2½ times higher than average—3.3 percent versus 1.3 percent (223).

Pertussis Vaccine

Pertussis vaccine is a suspension of killed *Bordetella pertussis* bacteria. Current pertussis vaccines are generally adsorbed, meaning that the killed bacteria are adsorbed, or bonded, to aluminum salts. Adsorbed vaccines appear to be more effective than vaccines made up of killed bacteria alone. Pertussis vaccine is almost always given in combination with diphtheria and tetanus toxoids. The combined vaccine is referred to as either DPT or, in the order that the components are listed on vaccine labels, DPT.

Three doses of DPT generally protect 70 to 90 percent of children against pertussis for at least 2 years and, according to some studies, for as long as 10 years (17, 65, 269). In most developed areas children are given three doses of pertussis vaccine beginning at about two months of age and then at intervals of at least four weeks after that. Many countries also recommend a fourth dose at about 18 months and a booster dose at age four to six years (98, 422).

In contrast, in developing areas it is important for children to receive three doses as early as possible because they tend to contract the disease at a very young age, when complications are most likely. The first dose does not provide actual protection against pertussis but rather primes the immune system for later doses. Most data suggest that pertussis vaccine will not produce this priming effect until an infant is about four weeks old, presumably because before that maternal antibodies interfere. The current WHO recommendation for developing countries is to give the first dose of DPT at about six weeks, the second dose four weeks later, and the third dose four weeks after that (581). Giving the doses at longer intervals is slightly more effective but leaves infants unprotected for a longer period. Providing a booster dose at about four to six years of age would likely extend protection throughout childhood (269).

There has been some debate over whether two rather than three doses of DPT can adequately protect young children against pertussis. Although two studies have indicated that two doses provide fairly high levels of protection (223, 516), most studies suggest that two doses would protect only about 50 percent (69, 404). A special high-potency vaccine and an interval perhaps as long as six months—which would leave infants vulnerable longer—are thought necessary for an effective 2-dose schedule (269). Further research should help to clarify the issue.

Although pertussis vaccine is more likely to cause side effects and adverse effects than the other EPI vaccines, it still is very safe compared with the risks of pertussis. Moderate local and systemic reactions—most often pain and swelling at the injection site and also fever—occur in one-third to one-half of those vaccinated. Neurological complications occur rarely, most often in children who have underlying neurological disorders. Convulsions have occurred after 0.3 to 90 of every 100,000 doses, compared with 600 to 800 of every 100,000 pertussis cases. Encephalitis has occurred after 0.1 to 3 of every 100,000 doses compared with 90 to 4,000 of every 100,000 pertussis cases (335, 501, 601). A British study that evaluated 1976-79 data concluded that the attributable risk of serious neurological damage (causing such problems as speech defects, motor disorders, and/or mental retardation) in previously normal children was very roughly one in 310,000 doses (242). WHO recommends that a second or third dose of pertussis vaccine not be given to a child who has suffered a severe adverse reaction to a previous dose; immunization with diphtheria and tetanus toxoids should be completed, however (501, 601). Some national authorities recommend somewhat different contraindications (422). A new vaccine made of parts of the pertussis bacterium has been used in Japan since 1981. So far, it appears to be as effective as the whole-cell vaccines and to produce milder local side effects (13, 136). It is thought that serious side effects will be fewer. A Swedish study is now testing this vaccine (39).

In a few developed countries publicity about cases of permanent brain damage after pertussis vaccination frightened many parents away from having their children vaccinated. Pertussis outbreaks resulted. For example, in Great Britain beginning in 1974, many parents refused pertussis vaccination for their children because of reports that it was ineffective and dangerous (69, 242). The incidence of pertussis in Great Britain rose from a low of about 4 per 100,000 population in the early 1970s to a high of about 150 per 100,000 in the late 1970s. Some 5,000 people, mostly young children, were admitted to hospitals with pertussis during the peak of the outbreak in 1977 and 1978, and 36 children died (242). Few children who had been vaccinated developed the disease, and those who did generally had relatively mild cases (65, 137, 351). Similarly, in Japan in 1974 and 1975 publicity about a few children who had suffered brain damage presumably related to pertussis vaccine led to a sharp decline in immunization levels. The number of reported cases of pertussis increased from about 300 to 400 per year in 1972-74 to about 13,000 in 1979. The number of deaths due to pertussis increased from

One of the first signs of neonatal tetanus is inability to suck. Even though neonatal tetanus is a major killer, many immunization programs have not given it high priority. (WHO)

fewer than 5 per year in 1972-74 to 41 in 1979 (197). Although it is clear that a vaccine with fewer side effects is desirable, these experiences demonstrate the importance of continuing to achieve high rates of coverage with the currently available vaccine to prevent illness and save lives.

NEONATAL TETANUS

Although neonatal tetanus is often called "the neglected disease" because few cases are reported, recent data suggest that it kills at least 800,000 infants each year (400, 482, 520, 568). Yet tetanus is not a contagious disease. It can easily be controlled through immunization as well as through better maternity care. While EPI programs focus on preventing neonatal tetanus, tetanus strikes people of all ages. In the long run countries should work to assure that everyone is fully vaccinated.

Neonatal tetanus strikes infants when they are from 4 to 14 days old and quickly kills most victims. The first symptoms—inability to feed and crying when trying to suck—usually appear between four to six days after birth. Most affected infants then develop general muscular stiffness and muscular spasms or convulsions. Treatment with tetanus antitoxin, muscle relaxants, and intravenous feeding may save a few infants. With or without treatment, however, some 85 percent die, usually within a few days after symptoms appear. Symptoms of tetanus in adults are similar—muscular stiffness, clenching of the jaw (thus the common name "lockjaw"), and painful muscular spasms. Although tetanus is usually severe, adults occasionally have milder cases, from which they recover fully (36, 404).

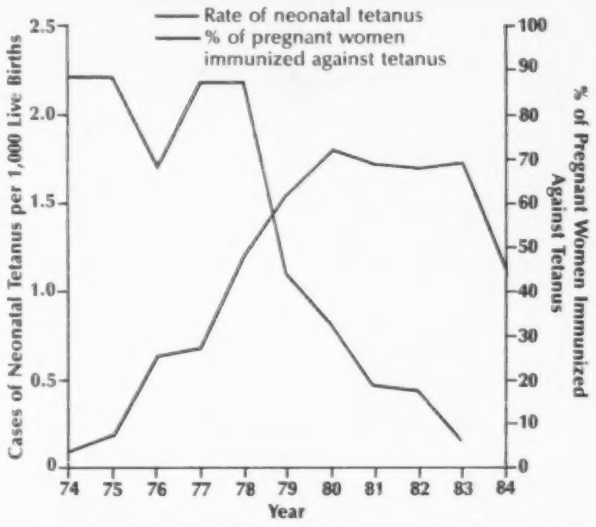
A toxin produced by the bacterium *Clostridium tetani* causes tetanus. The bacterium, which grows quickly in decaying tissue, is commonly found in the digestive tracts of humans and other animals. The bacterial spores can live for years in soil. Neonatal tetanus is almost exclusively caused by unhygienic treatment of the umbilical cord—cutting the cord with a nonsterile instrument, covering the umbilical stump with a nonsterile dressing, or treating the stump with a contaminated substance such as ash, mud, or, in some areas, animal dung (183, 243, 399, 404, 520). Adults usually are infected through puncture wounds or through unhygienic treatment of wounds.

While neonatal tetanus is virtually unknown in most developed areas, it remains a major problem in many developing countries. Data on exact incidence are not extensive, but community surveys were conducted recently in 14 Asian, Middle Eastern, and African countries (520). Among the findings are these:

	Neonatal Tetanus Deaths per 1,000 Live Births	% of All Neonatal Deaths
Yemen Arab Republic	3	8
Thailand	5	23
Sudan	9	32
Somalia	21	23
Nepal	15	39
Bangladesh (various surveys)	22–37	27–56
Pakistan	31	60
India (various surveys)	5–67	16–72

As these data suggest, neonatal tetanus is a major health problem in many areas. In general, neonatal tetanus is more common in agricultural areas than in urban areas.

Figure 3. Rate of Neonatal Tetanus and Percentage of Pregnant Women Immunized Against Tetanus, Sri Lanka, 1974–1984



Source: World Health Organization (555, 589)

In Sri Lanka immunization of pregnant women with tetanus toxoid reduced the incidence of neonatal tetanus. From 1977 to 1980, as the percentage of pregnant women immunized grew (black line), the incidence of neonatal tetanus dropped sharply (red line).

Also, neonatal tetanus tends to strike more male than female babies (520). Why this is so is unclear (399).

Tetanus Toxoid

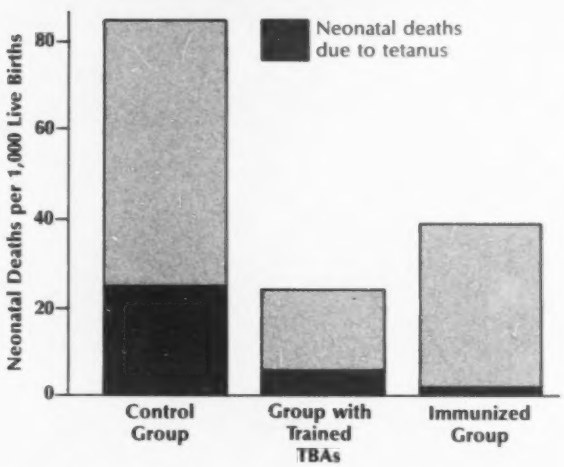
The currently available tetanus toxoid (TT) is a solution of inactivated tetanus toxin (thus the term toxoid) that has been adsorbed on aluminum salts (192). TT is given either alone or in combination with diphtheria toxoid and pertussis vaccine, as DPT. It is very safe, causing only occasional mild fever and local reactions such as soreness at the injection site.

Children born to mothers who are immune to tetanus are themselves immune for up to five months after birth. Thus vaccinating women prevents neonatal tetanus and at the same time protects the mother, who may be at extra risk of tetanus if she gives birth in unhygienic conditions. Women can either be immunized when they are pregnant, or they can be routinely immunized during their childbearing years.

If women are immunized only during pregnancy, they must receive two doses of TT in order to provide their babies with protection. These doses must be given at least four weeks apart, with the last dose at least two weeks before delivery. This protection lasts the mother for at least two years. After a third dose, protection lasts for about five years; after a fourth dose, for about 10 years. Five doses probably provide lifelong protection (520).

Studies in Bangladesh, Colombia, and Malaysia have proved the effectiveness of immunizing pregnant women to prevent neonatal tetanus (63, 259, 355, 542). In the Matlab *thana* (district) of Bangladesh, for instance, a study involving over 45,000 women found that vaccinating women against tetanus during pregnancy reduced the death rate among babies 4 to 14 days old by two-thirds, from 34 to 11 deaths per 1,000 live births (355, 542). Survey data support these results (see Figure 3). In Sri Lanka, for

Figure 4. Effects of Training Traditional Birth Attendants (TBAs) and of Immunizing Pregnant Women Against Tetanus on Neonatal Death Rates in Nine Districts of Bangladesh, Late 1970s



Source: Rahman (356)

Immunizing women with tetanus toxoid (TT) substantially reduces deaths from neonatal tetanus—even more than training traditional birth attendants (TBAs) in safe delivery practices. Training TBAs does more to lower overall neonatal death rates, however. Thus both are important to child survival.

instance, neonatal tetanus rates remained fairly stable during most of the 1970s at about 2 per 1,000 live births. After a program to immunize all pregnant women against tetanus began in 1978, the rate dropped sharply. By 1983 it fell to 0.16 per 1,000 live births, a 10-fold decrease (92, 555).

Routine vaccination of all women of childbearing age—whether pregnant or not—with two doses of TT at least four weeks apart also sharply reduces the rate of neonatal tetanus. In the Matlab study in Bangladesh (45, 354, 355, 356), for instance, immunizing women with two doses of TT an average of three to four years before pregnancy reduced the death rate among infants 4 to 14 days old by about 70 percent (355). In Colombia, among almost 3,000 women who had received two or three injections of TT, none lost a child to neonatal tetanus between 1961 and 1966. In contrast, the neonatal tetanus death rate among infants of unimmunized women was about 78 per 1,000 live births (259).

Of course, better maternity care also reduces neonatal deaths, not only by reducing the rate of neonatal tetanus, but also by avoiding deaths due to birth injury, respiratory problems, and other factors (37, 38, 61, 183, 356, 514). Studies in Bangladesh and the Philippines have directly compared the effects on neonatal death rates of training traditional birth attendants (TBAs) and of immunization programs. They found that training TBAs reduced the overall neonatal death rate more than immunization. Immunization programs, however, reduced the rate of neonatal deaths due to tetanus more than training TBAs (228, 356) (see Figure 4). Immunizing women of childbearing age against tetanus is a quick, effective, and inexpensive way to reduce the neonatal death rate. It can be done at the same time that other steps, such as training of birth attendants, are taken to achieve the long-term goal of improving maternal and child health care.

Immunizing children themselves against tetanus generally involves three doses spaced at least four weeks apart, as part of DPT injections (see p. L-160). Children who receive three DPT injections during infancy, starting at four to six weeks, are protected against tetanus throughout childhood. In most developed countries children receive a fourth DPT dose at about 18 months. A booster dose at four to six years probably extends protection against tetanus through the second decade of life (269).

POLIO

Poliomyelitis (polio) is the major cause of lameness in many developing countries. Where it remains endemic, an estimated 3 to 10 of every 1,000 children develop paralytic polio. Worldwide, close to 300,000 cases occur each year (162, 404, 568). Some 30,000 may die.

Most individuals infected with polioviruses, of which three types are known, have no symptoms at all. At most, only one of every 100 infected people actually develops recognized symptomatic disease (179, 432), and estimates have ranged as low as one of every 850 (210). Asymptomatic individuals (many of whom may actually have mild, cold-like symptoms) shed polioviruses from the throat and digestive tract, however. Thus they can infect others through direct contact or through fecal contamination of food or water.

Symptoms of recognized polio include fever, malaise, muscle pains, headache, nausea and vomiting, and stiffness of the neck and back with or without paralysis. Paralysis usually affects the legs, more often one than both (404). Of those who develop paralytic disease, about 10 percent die, 14 percent will be unable to walk due to severe paralysis, and 14 percent will be lame—that is, unable to walk normally. The remainder recover completely or have only residual weakness of an affected limb (432).

In developed countries in the first half of the 20th century, polio occurred in periodic outbreaks in the summer or early fall. Usually school-age children were affected most severely. In the US between 1944 and 1954, the annual incidence was about 20 cases per 100,000 population (179). The widespread use of effective vaccines starting in the mid-1950s, however, has virtually eliminated polio from developed nations and, more recently, some developing nations (see Figure 5).

It was once assumed that polio was not a major problem in the developing world since highly visible outbreaks were rare. Since 1974, however, some 100 "lameness surveys" in 25 countries have found that polio occurs at least as often in many developing areas as it did in developed areas at the height of epidemics (41, 179, 211). For instance, in Ghana in 1974, between 5.8 and 7 per 1,000 children ages 6 to 19 had some residual paralysis due to polio (41). From these data it was estimated that the annual incidence of symptomatic polio was about 22 per 100,000 people of all ages (179). In Morocco in 1980 the rate of residual paralysis in children ages 5 to 14 was 5.3 per 1,000. This translated into an estimated annual incidence of 40 per 100,000 people of all ages (179).

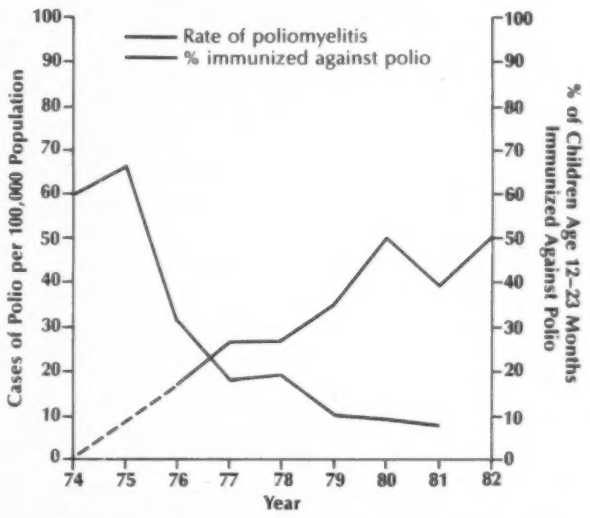
In developing areas today polio usually is endemic rather than epidemic. Children are exposed to polioviruses at a very young age; almost all have been infected before age five. The majority have no symptoms and develop permanent natural immunity to later infection (179, 432). Unless immunization coverage expands, however, epidemic patterns of disease may emerge as countries develop.

Polio Vaccines

There are two polio vaccines in use today: a live virus vaccine that is administered orally (OPV) and an inactivated (killed) virus vaccine that is injected (IPV). When both were first used in the 1950s and 1960s, there was considerable controversy about which was the safer and more effective. In some circles the controversy continues, although most experts agree that both are safe and effective. For several reasons, however, OPV is by far the more widely used and is recommended by EPI:

- Oral administration is easily carried out by minimally trained staff.
- OPV is much cheaper than IPV. Large quantities of OPV cost about $.02 (US) per dose compared with about $.50 per dose for IPV (7, 585, 635).
- Children given OPV always develop antibodies in the intestinal tract as well as in the blood (circulating antibodies). Because of this, children immunized with OPV do not spread wild (or natural) poliovirus through fecal transmission to others in the home and community. IPV induces lower levels of antibodies in the intestinal tract (233, 585).
- Children given OPV shed the harmless vaccine virus in their stools for several weeks. Thus, as they are developing immunity themselves, vaccinated children are a source of vaccine virus that can immunize unprotected individuals. This beneficial natural spread of vaccine virus is most likely to occur in communities with poor sanitation, where the dangerous wild polioviruses also spread rapidly (585).

Figure 5. Rate of Poliomyelitis and Percentage of Children Age 12–23 Months Immunized Against Poliomyelitis, Yaoundé, Cameroon, 1974–1982



Note: No data on percentage of children immunized available for 1975
Source: Foster et al. (632), Foster (631)

In Yaoundé, Cameroon, the polio rate dropped sharply (red line) as the percentage of children immunized with oral polio vaccine under the national program gradually increased (black line).

In most developed countries children initially receive two or three doses of OPV, starting at about age two months and then at one- to three-month intervals. A third or fourth dose often is given at about 18 months and a booster dose at 4 to 6 years. US data suggest that the first dose induces circulating antibodies against each of the three types of poliovirus in about 40 to 80 percent of children. Two doses induce antibodies against each type in about 85 to 100 percent, and three doses induce antibodies against each type in close to 100 percent (198).

In developing countries EPI currently recommends that children be given four doses of OPV: one at birth and then three more at ages 6 weeks, 10 weeks, and 14 weeks (that is, at the same time as DPT injections).

The EPI recommendation for a first dose of OPV at birth is a new one, made in 1985 (541). Even though the dose at birth may provide only partial and temporary protection (144, 541), it is important for two main reasons. First, where polio remains endemic, polio cases occur in the first months of life. A dose at birth will prevent many of these cases (570). Second, some children's only contact with health personnel may be at birth. They may have no other opportunity for polio vaccination (140, 144, 541).

OPV vaccination programs have markedly reduced the incidence of polio in some developing countries. In Costa Rica, where OPV has been used since 1960, indigenous polio appears to have been eliminated; no cases have occurred since 1984 (217). Other countries, including Brazil, Cuba, and Mexico, have had great success with mass campaigns that administer OPV to all young children once or twice a year (114, 363, 371, 377, 378) (see p. L-171). In

New PAHO Goal: No Polio in Americas by 1990

In May 1985 the Pan American Health Organization (PAHO) announced the goal of eradicating the indigenous transmission of wild poliovirus in the Americas by 1990. A number of other agencies, including UNICEF, US AID, Rotary International, and the International Development Bank (IDB), have endorsed this goal. PAHO proposes achieving the goal by accelerating national EPI activities—including routine immunization, regular disease surveillance, and cold chain development—and, where appropriate, by using special strategies including national vaccination days. At the international level, PAHO will develop special administrative and surveillance procedures to monitor each country's progress (290, 301).

Countries in Latin America and the Caribbean already have made great progress towards controlling polio. The proportion of children who received three doses of polio vaccine by one year of age reached about two-thirds in 1984. The use of national vaccination days in many countries has contributed to this increase (315). PAHO estimates that coverage must reach and be maintained at over 80 percent for the 1990 goal to be attained (290).

Chile and China also, widespread use of OPV has dramatically reduced the incidence of polio (50, 102).

Although in many developing areas OPV provides protection equal to that found in developed countries, studies in some tropical areas, including studies in Brazil, India, and Nigeria, have found that OPV induced significantly lower levels of circulating antibodies (198, 627). It has been hypothesized that intestinal viral infections interfere with OPV or that breakdowns in the cold chain rendered some vaccine ineffective (198). It has not yet been shown that these lower levels of circulating antibodies actually lead to lower levels of protection against polio, however.

While OPV is generally one of the safest vaccines available, it does have a very rare but serious side effect—paralytic disease in vaccine recipients and their unimmunized or partially immunized contacts. According to data gathered in 13 countries between 1970 and 1979, the risk of vaccine-associated paralysis is less than one in every two million doses of OPV. Some 90 percent of reported recipient cases occurred after the first dose (517). Vaccine-associated paralysis occurs because the safe vaccine virus reverts on rare occasions to the wild, virulent state.

Recently, some experts have suggested that IPV should replace or supplement OPV in both developing and developed areas (164, 381). They cite at least four reasons: First, IPV does not appear to carry a risk of vaccine-associated paralysis. (Experience with IPV has not been extensive enough to detect extremely rare adverse events, however.) Second, a more potent IPV has been developed recently that may provide long-lasting protection without the need for booster doses (381, 383). Third, IPV appears to be equally effective in all regions. IPV could be combined with DPT (231, 382), but assuring a long enough interval between doses of IPV might postpone full protection against pertussis. Although IPV may be appropriate in some areas, until it can be produced more cheaply, widespread use is not likely.

One proposal has been to administer an initial injection of IPV and subsequent doses of OPV, thereby both preventing vaccine-related paralysis and minimizing fecal transmission (233). Even if the cost of IPV were substantially reduced, however, such a 2-vaccine schedule might not be feasible for large-scale programs operating with limited logistic flexibility.

TUBERCULOSIS

Tuberculosis (TB) is a complex disease that can affect many different organs (36, 96). Since TB usually progresses slowly, sudden epidemics, such as can occur with measles or polio, occur infrequently, and transmission of the disease often goes unnoticed. Nonetheless, TB is a major cause of disability and death. In 1981 it was estimated that 10 million new cases occurred each year. Between 1970 and 1979 the number of reported deaths due to TB ranged from about 50,000 to about 150,000 each year (599).

While pulmonary TB is the most commonly observed form in adults, more acute forms—including miliary, or disseminated, TB and tuberculosis meningitis—are common in infants and young children. The symptoms of pulmonary TB are usually cough, slight fever, night sweats, blood in sputum, chest pain, and weight loss. Symptoms of other forms depend on the affected organ. Tuberculosis meningitis is often an acute illness beginning with fever and headache and leading to various central nervous system symptoms including behavior changes and coma. It is usually fatal if untreated. Even with prompt treatment it often produces permanent brain damage. Other bodily systems that TB can affect include the intestines, bones, and urogenital organs (31, 36, 181, 603).

Treatment of TB is often protracted, and the outcome, sometimes uncertain. Treatment involves taking a combination of drugs for at least six months and often lasts more than one year. Progress must be regularly monitored. The drugs prescribed vary according to the type of TB being treated and the patient's progress. In addition, some strains of TB are resistant to the standard drugs (23, 181, 395).

While not as contagious as measles or pertussis, TB is easily spread. It is generally contracted either by close contact with an infected person who is coughing up TB bacilli or by drinking unpasteurized contaminated milk. TB is most common in poor, crowded areas, since these conditions favor transmission of infection and people in these areas often have lowered resistance to infections.

Not all infected persons develop symptomatic disease—only an estimated 5 percent within a year after infection. Once a person has been infected, however, TB symptoms can occur at any time. Latent bacilli may begin multiplying whenever immunity to infection is lowered, such as periods of undernutrition or extreme fatigue or stress (36, 603). Women overburdened with childbearing also may be particularly susceptible to developing active disease and may then pass TB on to their children (357). Those infected in infancy have a 10 percent chance of developing symptoms at some time in their lives (36).

TB remains a health problem throughout the world, but rates are particularly high in many developing areas. In some parts of Africa, Asia, and Oceania, the incidence of pulmonary TB alone is as high as 300 cases per 100,000. Reported rates in South America range as high as 225 per 100,000 in Bolivia, and 70 per 100,000 is typical (291, 599, 603). Actual rates throughout the developing world may be higher because reporting is often incomplete. By comparison, in the US the incidence of TB is about 12 cases or fewer per 100,000 (291). Even though this rate is low compared with those in developing countries, TB is now the most common EPI disease in the US.

In the developing world in the 1970s, rates of death from TB ranged from one to 76 per 100,000 population per year. Mortality rates generally have declined over the years due to improving case-finding, treatment, and immunization efforts. Trends differ from place to place, however. For example, the mortality rate held steady in Ecuador at 18 per 100,000 between 1972 and 1978, whereas in Chile it declined by 50 percent between 1974 and 1983, reaching 8.1 per 100,000 in 1983 (36, 318, 327).

BCG Vaccine

BCG vaccine contains an attenuated strain of the bacillus *Mycobacterium bovis*. A number of different strains are prepared in laboratories throughout the world, but all of them originate from a strain developed by Calmette and Guerin in the early 1900s (64, 109). WHO recommends

The angle of this infant's head is a sign of tuberculosis meningitis. While the effectiveness of BCG vaccine has been questioned, it probably protects young children somewhat against tuberculosis meningitis and other serious forms of TB. (WHO)

intradermal administration, but subcutaneous, intramuscular, and scarification methods also have been used.

In contrast to other EPI vaccines, the efficacy of BCG vaccine remains at issue, even though for decades it has been administered to many people. Although the concensus is that it at least partially protects children against TB, studies over the last 50 years have produced conflicting results. Protection was great, ranging from 75 to 80 percent, in North American Indian children and young adults, in midwestern US infants, and in British young adults (22, 149, 236, 373). It was slight, ranging from none to about 30 percent, in the general population of two regions of India, in Puerto Rican children and young adults, and in southern US children (75, 76, 77, 125, 412, 598). A recent analysis that evaluated all these studies concluded that the ones reporting the highest efficacy were those with the best methodology and greatest statistical precision (24, 70).

An ongoing Indian study, conducted with assistance from WHO, has further complicated the issue of BCG efficacy. After 7½ years' follow-up of about 260,000 people of all ages in South Indian villages, the study appeared to show that BCG had provided no protection against TB (598). A WHO study group reviewing the research concluded that the study might have been unable to detect a real protective effect, in part because it focused on pulmonary TB rather than on other forms of TB that are more common in young children (579). BCG is thought to provide the most protection against childhood TB—usually nonpulmonary—that occurs soon after infection (60). Also, people in the study areas are frequently infected with bacteria similar to the one that causes TB. This may provide some immunity to TB, thereby masking immunity provided by BCG (444, 579). These factors may have contributed to the variation in the results of other studies as well.

Further follow-up in the South India study has recently produced different results, suggesting that BCG may provide some protection when given to infants and young children. Children up to 14 years old who had been followed for up to 12½ years were evaluated. Among children followed for five years or less, no protective effect against pulmonary TB was seen. Among those followed from 5 to 12½ years, however, about 50 percent were protected against pulmonary TB. Thus, apparently, observing children at an older age, when pulmonary TB is more likely, revealed the protective effect (412). Preliminary results of follow-up through 15 years resemble those after 12½ years (347).

Recent retrospective studies also suggest that BCG provides some protection when given to very young children. In South Korea, Malaysia, and Singapore, studies comparing the number of children with TB who had been vaccinated with the number who had not been vaccinated concluded that BCG had a protective effect for 60 to 90 percent (652). Further research to evaluate BCG efficacy is underway in a number of developing countries (347).

Two basic strategies are used to control TB. In general, where TB is a significant problem, and screening and treatment are not widely available, BCG is administered to all children to protect them against the severe forms of TB. In EPI, WHO recommends one dose of BCG for every newborn. In contrast, where TB is less common, and screening and treatment are available, BCG may not be recommended. Screening and treatment are considered a more effective and less risky way to control TB (579, 620). Many developed countries vaccinate only uninfected contacts of persons with TB and people in certain high-risk groups.

The BCG vaccine is relatively safe, although after inoculation 0.1 to 4 percent of children under age two years have developed lymph node enlargement leading to ulceration (501). Almost all children develop a raised papule at the injection site, which occasionally develops into a slow-healing abscess. How often this happens may depend on the BCG strain used. In general, the papule gradually heals, leaving a pitted scar that identifies children who have had BCG. The most severe complication, disseminated BCG infection, is very rare. It occurs in less than 0.1 per 100,000 vaccinated individuals (226, 255, 428, 501, 601).

DIPHTHERIA

Although diphtheria is endemic in many developing countries, it is not as significant a public health problem as other EPI diseases. In many developing countries, widespread natural immunity resulting from cutaneous (skin) diphtheria infection and asymptomatic infections limits the extent of the more severe form of the disease. As living standards rise, however, fewer mild and asymptomatic infections will occur, and acute diphtheria could become a more widespread problem (145, 162, 625).

Acute diphtheria is a disease of the upper respiratory tract—pharynx, larynx, and nose. The first symptoms are fever, malaise, and mild sore throat. The lymph nodes in the neck become enlarged and tender. The affected site in the upper respiratory tract appears red and inflamed and is covered by a grey membrane. When the membrane extends downwards to the larynx, it can obstruct the air passage (especially in young children) and cause asphyxiation. Rare complications include myocarditis (inflammation of the heart muscle), which is usually fatal, and nerve palsies (often affecting the soft palate, eye, and face), which gradually diminish (36, 145, 625).

Treatment consists of intramuscular or intravenous administration of diphtheria antitoxin and antibiotics. Started early in the disease, treatment stops further spread of the infection and relieves symptoms.

Toxin produced by a bacterium *Corynebacterium diphtheriae* causes diphtheria. It is a moderately contagious disease: attack rates are about 10 to 30 percent among close contacts of an infected person. The infection spreads by direct contact with respiratory secretions and by contact with contaminated objects such as eating utensils. Carriers, who generally feel well except for a nasal discharge, also spread the disease.

Diphtheria occurs primarily in children under age 15 who have not been immunized and particularly in those under age 7. It is most common in countries with very poor urban populations who live in overcrowded, unsanitary conditions and have limited access to health care. Among the EPI diseases, the prevalence of diphtheria is the least documented (162). According to WHO statistics, the number of diphtheria cases was about 92,000 in 1980 and 46,000 in 1983 (590). These figures undoubtedly underestimate incidence since reporting is incomplete in most countries. About 10 to 15 percent of cases die (625).

Once prevalent worldwide, diphtheria has been virtually eliminated in the developed world by the high level of immunization coverage. For instance, in the US, five or fewer cases of diphtheria were reported each year between 1980 and 1983 (634). Because of improving immunization coverage, incidence has been declining in developing countries as well. In India, where a substantial proportion of the world's diphtheria cases occur, the number of reported cases decreased from almost 27,000 in 1974 to about 10,000 in 1984 (590). In Venezuela reported incidence declined from 9.9 per 100,000 population in 1956-60 to 1.1 in 1971-75 and 0.2 in 1980. In Indonesia between 1978-79 and 1980-81 the incidence in children age four and younger (many of whom had received the two doses of DPT recommended by the Indonesian program) declined from 4.3 to 1.7 per 100,000 (466).

In many developing countries children acquire natural immunity to diphtheria from having mild skin or chronic nasal diphtheria infections early in life. From 15 to 60 percent of skin ulcers may result from diphtheria-causing bacteria, and people infected in this way are then immune to the serious form of the disease (145, 353, 413, 625). Chronic nasal infections also are common. A study in India found that 3.5 percent of preschool children were nasal diphtheria carriers. The rate was higher in children living in poorly ventilated houses and in those not fully immunized (215). In Thailand high levels of diphtheria antitoxins (indicating immunity to the disease) have been found in 64 percent of children with no history of immunization. This natural immunity probably prevented disease outbreaks despite low immunization coverage (219).

Diphtheria Toxoid

The currently available diphtheria toxoid is a solution of inactivated diphtheria toxin adsorbed on aluminum salts to make it more effective (422). It is usually given in combination with tetanus toxoid and pertussis vaccine, as DPT.

The recommended schedule for diphtheria toxoid is determined by the schedule for the pertussis component of the combined vaccine (see p. L-160). According to WHO recommendations, in developing countries the first dose of DPT should be given at six weeks, with two subsequent doses four weeks apart. This 3-dose schedule should confer adequate long-term immunity to diphtheria on nearly all children. Two doses produce immunity in 90 to 100 percent of vaccinated individuals, and a third dose improves the degree of immunity and generally extends protection for as long as 13 years (269).

In developed countries children usually are given three doses of DPT, beginning at two months of age and thereafter at one- to three-month intervals. Many countries also recommend a fourth dose at 12 to 18 months and a booster dose at about four to six years. The fourth dose may be important where natural infection is rare. In some areas as many as 30 percent of those vaccinated have low antitoxin levels (indicating little protection) by 12 to 18 months after the primary series of three doses. The value of the booster is debatable, however (269).

The side effects associated with diphtheria toxoid are not serious. They consist most often of pain, redness, and swelling at the injection site and slight fever.

OTHER COMMON VACCINE-PREVENTABLE DISEASES

In addition to the vaccines against the six diseases targeted by EPI, many other vaccines are available and in some regions are widely used. In developed countries vaccines against **mumps** and **rubella** (German measles) are often given along with measles vaccine. While both mumps and rubella are relatively mild childhood illnesses, mumps can be serious in adults, and rubella can cause multiple congenital defects in the children of women who contract it during the first trimester of pregnancy. In the US, for example, after a 1964 epidemic of rubella, some 20,000 infants were born with congenital rubella syndrome (CRS). Since the rubella vaccine was licensed in 1969, the incidence of rubella and CRS in the US have steadily declined (209, 440). The measles/mumps/rubella (MMR) vaccine is not widely used in developing countries because it costs much more than the measles vaccine alone.

Other vaccines often used in developed countries are the influenza vaccine and, among high-risk groups, hepatitis B vaccine. A recently licensed vaccine against ***Haemophilus influenzae* type b disease**—a major cause of bacterial meningitis in children under age five—is now being widely given to US children age two years and older. The vaccine is not effective in younger children, however, who are at highest risk. **Hepatitis B** is a viral disease transmitted by contact with the blood of an infected person, through sexual relations with an infected person, or from mother to infant at birth. It is a debilitating disease. About 10 percent of infected individuals become chronic carriers. About one of every 5 carriers dies from cirrhosis of the liver and about one of every 20 dies from liver cancer (167). The current vaccine is very expensive. Research is progressing on a less expensive vaccine (see box, p. L-167).

The vaccine against **yellow fever** is widely used in many developing areas, particularly in countries of the "yellow fever belt"—Central America, the northern regions of South America, and Central Africa (414, 420). Yellow fever is a viral illness transmitted by a species of mosquito found mainly in certain forested areas. Severe cases involve

bleeding from various mucosal tissues and severe jaundice. In general, about 10 percent of cases die. The more serious forms of yellow fever kill as many as 80 percent of those infected (338).

Vaccination strategies against yellow fever vary. A few Central African countries—Burkina Faso, for instance—have included yellow fever vaccination in EPI campaigns (53). Many Latin American countries vaccinate at-risk popula-

Vaccines of the Future

A number of new vaccines are likely to become available before the turn of the century. Some could protect against diseases important in the developing world, such as rotavirus infection, which is a major cause of severe childhood diarrhea, and malaria.

New biotechnology, including recombinant DNA, monoclonal antibody, and protein synthesis techniques, has spurred vaccine research. These techniques allow researchers first to isolate the specific portions (or antigens) of disease-causing microbes that trigger immune responses and then to produce these portions in large amounts for use in vaccines (13, 27, 193, 264, 384). These so-called molecular vaccines have three major advantages over many of the currently available vaccines:

- They do not require growing or collecting large quantities of potentially dangerous disease organisms.
- They are less likely to cause major side effects than whole-cell or whole-virus vaccines.
- Once developed, molecular vaccines will be much less expensive to produce.

Eventually, genetically engineered antigens may be incorporated into living microbes, which will act as carriers to introduce the antigens into humans. One possible carrier is cowpox virus, the original smallpox vaccine. In fact, some researchers envision incorporating a number of different antigens into the cowpox virus genetic material. People vaccinated with these materials would develop immunity to various diseases, including cowpox (264). An important advantage of using cowpox virus as a carrier is that the resulting vaccine is extremely heat-stable in freeze-dried form and is easy to administer.

While vaccine research is receiving increasing support from many agencies, the gap between a promising vaccine and a commercial product can be wide. Each problem in field testing—for instance, a high incidence of a minor side effect—can add a year to the development process (129). Also, commercial manufacturers may be reluctant to produce vaccines because the costs of research, development, and winning regulatory agency approval are high, and thus profits may be low (264). Furthermore, in some developed countries individuals have sued vaccine manufacturers over alleged adverse effects and sometimes won large damage awards. This has been a particular problem with pertussis vaccine and OPV (233).

Current Research

WHO has placed high priority on new vaccines against diarrheal diseases. New vaccines against cholera and typhoid are being developed to replace the current ones, which are only partially effective and produce high rates of side effects (218, 264, 491). Particularly important would be a vaccine against rotavirus, a major cause of severe diarrhea in children, which kills as many as one million people each year (46, 93, 104, 116, 129). An oral rotavirus vaccine, tested first in Finland and now in The Gambia and Peru, may be 50 to 80 percent effective and may protect best against severe cases (93, 129, 429, 491).

WHO also has placed high priority on developing vaccines against leprosy, dengue (a febrile disease transmitted by mosquitoes), and African hemorrhagic fever. These vaccines probably will not be available for at least five years, however (3, 262, 491).

Many researchers are working on a vaccine against malaria, which in some areas kills as many as 50 of every 1,000 children under age five (264). Using new biotechnology, researchers are developing vaccines against the malaria-causing parasite, which is transmitted by mosquitoes. To be effective, a vaccine may have to act against the one-celled parasite in at least two of the three forms of its life cycle (247, 316, 344, 392). Preliminary tests on humans could begin within two years (316).

An inexpensive vaccine against hepatitis B could save many lives. Worldwide, some 200 million people are thought to be carriers of hepatitis B (167) (see p. L-166). At over $100 (US) for the 3-dose series, the current hepatitis B vaccine is far too expensive for widespread use. A recent report suggested that the dose can be reduced by 90 percent if hepatitis B vaccine is given intradermally instead of intramuscularly (79, 358). While this would lower the cost by about two-thirds (79), the vaccine would still be too expensive in many areas. Researchers are now using recombinant DNA technology to develop a molecular vaccine, which could be much cheaper (232, 264, 337).

Research is progressing on vaccines against various organisms that cause respiratory illnesses, including respiratory syncytial virus, a major cause of croup and pneumonia (26, 167, 491). Also being investigated are vaccines against the sexually transmitted diseases gonorrhea and genital herpes (167).

Researchers working on a vaccine against the virus associated with Acquired Immune Deficiency Syndrome (AIDS)—a new and growing health problem throughout the world—face a number of challenges. While the AIDS-associated virus does stimulate antibody production, the antibodies generally do not destroy the virus. Reseachers are working to determine which part of the virus stimulates an effective immune response. Also, the AIDS-associated virus takes many different forms. A vaccine may have to be developed that protects against most of these forms (124, 207, 212).

tions every few years, after a substantial number of unprotected individuals has built up (340). Because of the seriousness of the disease, outbreaks usually prompt immediate mass vaccination campaigns. For instance, in response to a 1983 outbreak in Ghana and Upper Volta (now Burkina Faso), over one million people were vaccinated in three weeks (574). In response to a 1978 outbreak in Colombia, 92 percent of people in an affected city of over 100,000 were vaccinated in four days (340).

Vaccinations against meningococcal disease, Japanese B encephalitis, cholera, and typhoid fever also are given in some developing countries. **Meningococcal disease,** a bacterial illness, is endemic throughout the world. Epidemics also occur in some areas, particularly West Africa. Epidemics often strike hardest at children under age four, and these children often develop the most severe form of the disease, meningitis. If untreated, meningococcal meningitis kills 50 percent of cases or more. The meningococcal vaccine—often called the meningitis vaccine—is relatively safe and effective. It has little effect, however, in children under age one and is only partially effective in children between ages one and two (423, 424, 559). A number of West African countries have carried out mass vaccination campaigns against meningitis. Burkina Faso administered 1.7 million doses of meningococcal vaccine in the 1984 "Vaccination Commando" campaign against measles, yellow fever, and meningitis (53) (see p. L-171).

Japanese B encephalitis is a viral disease transmitted by mosquitoes. It occurs in epidemics in summer months in many Asian countries from the eastern USSR to Japan. Although many mild infections are not recognized, one in 300 to 500 affects the central nervous system. Among these cases, fatality rates range from about 30 percent in those under age 20 to 80 percent in older people. Survivors may have permanent neurological damage (31, 181). The vaccine against Japanese B encephalitis provides good protection and is used widely in Japan and some other countries, mostly during epidemics (420).

Vaccines against **cholera** and **typhoid fever,** two severe intestinal infections, have been available for decades. They are still widely used in some developing countries. Yet they cause adverse reactions and are not very effective. The typhoid vaccine is about 50 to 70 percent effective. The cholera vaccine is only about 50 percent effective and protects for only three to six months (264, 420). Studies in Bangladesh in the late 1970s questioned whether it was effective at all against some cholera strains (85). Work is progressing on new, safer, more effective vaccines against these two diseases (see box, p. L-167).

DELIVERY STRATEGIES

Four main strategies are used to deliver immunization services:

- Fixed facilities offering immunizations at any time or on a weekly or monthly basis,
- Outreach services periodically offering immunizations at locations away from fixed facilities,
- Mobile teams traveling to areas that have no other access to immunization services, and
- Intensive activities, such as mass campaigns and national immunization days, vaccinating large numbers of people in a short time.

Except for fixed facilities, these strategies reach people through either collection-point delivery, in which people are instructed to come to a given place at a given time, or, occasionally, house-to-house delivery, in which health workers visit homes to immunize children and pregnant women (90, 98, 110, 160).

Three main factors must be taken into account when planning immunization delivery:

(1) The vaccination schedule. Ideally, the EPI vaccines should be administered to children before they reach age one (see p. L-171). Thus programs must choose delivery strategies that make immunizations readily and repeatedly available at times and places convenient to parents of young infants.

(2) The state of existing health care systems and communication/transportation infrastructure. Where the existing system is poorly developed—for instance, where there is a shortage of personnel, equipment, and facilities—it may be especially difficult to develop an effective immunization program. Special measures, such as heavy reliance on mobile teams or vaccination days, may be necessary (90, 110, 135, 139).

(3) The local pattern of vaccine-preventable diseases. Different disease-control strategies may be necessary in different regions. Where yellow fever is endemic, for instance, yellow fever vaccination should be included in the program and older children targeted as well as infants. When outbreaks of a disease such as polio occur, immediate and intensive immunization campaigns may be necessary.

Fixed Facilities

Most countries provide immunizations through fixed facilities such as health posts, clinics, and hospitals, which provide a range of health services. Establishing immunization as a regular service of fixed clinics is a crucial step toward making immunization a permanent part of basic health care (110, 160).

On one hand, there are several advantages to delivery through fixed facilities. First, there are no costs for transporting personnel to other locations. Second, personnel who can give injections and instruct parents are already available, as is basic medical equipment. Third, it usually is easier to keep vaccines at proper temperatures. Fourth, client records may be more easily established and kept up to date (110, 160).

On the other hand, there are at least two major disadvantages to delivering immunization only through fixed facilities. First, in many areas, parents must travel long distances to bring children to health centers. The farther parents must travel, the less likely they are to come for immunizations, even though they might travel long distances at inconvenient times to bring a sick child for treatment (152). Second, in some countries the established health care system may not be able to provide adequate immunization services along with other basic services. Many fixed facilities offer immunization only once a week or even only once a month. Furthermore, there may not be enough facilities throughout a country. There may not be adequate refrigeration equipment available to maintain the cold chain in all regions. Local health care personnel

may not be adequately trained or motivated. In Turkey, for instance, the immunization efforts of routine health services were judged inadequate for such reasons as problems delivering vaccines at times and places convenient to parents, not enough vehicles, and inadequate cold chain (42).

Countries with a well-developed basic health care system, good transportation, and widespread community awareness of immunization can attain high levels of coverage through fixed facilities. For instance, both Cuba, a small country with a well-developed health care system and extensive community involvement, and Bahrain, a small, largely urban country with an excellent road system, have successfully immunized significant proportions of children largely through fixed facilities (110, 293, 651). For DPT and OPV, for example, the coverage of children one year of age in 1984 was over 85 percent in Cuba and was 80 percent in Bahrain (see Table 1). At present, however, many developing countries need other strategies in addition to fixed facilities.

Outreach Services and Mobile Teams

Two common approaches that supplement fixed facilities are outreach from fixed facilities and the use of mobile teams. Both of these approaches can reach children in remote rural areas and poor urban areas as well as other children whose parents are unable or unwilling to travel to health centers. Furthermore, they can provide services at intervals that match schedules for DPT and OPV.

There are two major disadvantages to outreach services and/or mobile teams. First, scheduling visits and adhering to schedules are difficult because of transportation problems or poor weather. In Belize in 1984, for example, mobile teams often could not operate as planned because vehicles were not available (34). In Nigeria and Kenya in the late 1970s and early 1980s mobile teams were plagued by equipment breakdowns and difficulties in maintaining the cold chain (490, 552). Many countries do not use mobile teams during the hottest season, mainly because of cold chain problems (110).

Second, outreach services and mobile teams can be expensive. Staff often must be paid for extra time and expenses, and vehicles must be bought and maintained (90, 110, 160). When well-run, however, these approaches can be cost-effective because they serve many more children per day than fixed clinics. In parts of Thailand and Ghana, for instance, mobile teams cost less per immunized child than fixed facilities (80, 83).

Alerting people to team visits is crucial. In Nigeria lack of publicity about mobile team visits was another reason for their poor performance (188). In the past few years the Nigerian program has improved communication, publicizing vaccination sessions through posters, flyers, radio messages, loudspeaker vans, and house-to-house visits. These efforts may have increased the number of vaccinations as much as tenfold in some regions (135). In some countries health personnel go from house to house to immunize residents. This approach is expensive and time-consuming, but it may be necessary where public knowledge about immunization is slight. It also may be necessary in Muslim areas where women and children seldom leave their homes (152).

The EPI in Pakistan has made remarkable progress in increasing vaccination coverage, in part by expanding outreach services. The program was accelerated in 1982, when only an estimated 6 percent of children age 12 to 23 months were fully vaccinated. Surveys in certain districts found that by 1984 vaccination coverage had increased to 58 percent. In Punjab, the district that has achieved the highest coverage—about 80 percent in 1984—a repeated outreach strategy that includes a strong communication effort probably made the difference. Outreach teams visit rural areas three times a few days apart: first, to tell people about immunization and distribute immunization cards; second, to vaccinate children; and third, to vaccinate children who were missed during the second visit (530).

Intensive Immunization Campaigns

Intensive immunization campaigns have been carried out in many countries including Brazil, Burkina Faso, Ecuador, Colombia, El Salvador, Ghana, and Turkey (42, 53, 135, 165, 286, 303, 363, 364, 387). They currently are being planned in a number of countries, including Bangladesh, Botswana, Egypt, and Kenya (196). Regularly repeated mass campaigns have been used to immunize children routinely against one or more diseases, and emergency mass campaigns have been mounted to stop epidemics by quickly immunizing as many susceptible people as possible. The place of intensive campaigns in immunization efforts is currently being debated. Recently, international experts, particularly at UNICEF, and national leaders have seen intensive campaigns as a catalyst to speed up routine EPI activities. They see such campaigns providing the basis for an effective routine immunization program by sharply reducing the backlog of unimmunized children, improving inadequate program elements (such as cold chain, reporting, and vaccine delivery procedures), and focusing parents' and policy-makers' attention on immunization (135,

An Ecuadorean child receives oral polio vaccine (OPV). OPV often has been distributed in intensive immunization efforts, partly because volunteers can administer it easily. (Wolff/UNICEF)

196). Other experts, while acknowledging the impressive short-term impact of intensive campaigns, are concerned that they may not contribute to developing an immunization program with long-term stability (482, 619).

Intensive campaigns have sharply increased vaccine coverage. In 1984 Colombia carried out a "Vaccination Crusade." Three nationwide vaccination days were held to administer DPT, polio, and measles vaccines to all children under age four. In some areas health workers traveled from house to house before the campaigns to alert people (see p. L-179). It was estimated that, by the end of the campaign, close to 80 percent of children below age four were fully immunized. Immunization coverage of children by age one doubled between 1982 and 1984, increasing from about 30 percent to about 60 percent. To date, there are no reports on how the campaigns affected disease incidence (387).

A similar approach was taken in El Salvador in 1985. National "days of tranquility" were declared on the three vaccination days so that fighting would not disrupt vaccination efforts. Coverage among children under five with DPT, polio, and measles vaccines increased from below 30 percent to between 60 and 70 percent (165).

In Turkey in 1985 three 10-day national immunization campaigns spaced one month apart dramatically increased DPT, polio, and measles vaccine coverage. Coverage among the target group, children under age five, increased from about 25 percent to about 80 percent. Because this backlog of unimmunized children was eliminated, the routine EPI can now concentrate on regularly immunizing children under one and pregnant women (42).

In November and December 1984 Burkina Faso staged a "Vaccination Commando" campaign to vaccinate all children ages nine months to six years against measles and all those ages one to 14 against yellow fever and meningitis. The campaign was conducted because EPI efforts since 1980 had not raised coverage above 20 percent for any vaccine, and disease outbreaks often occurred. The campaign focused on single-dose vaccines to avoid the need for repeat immunizations. Fixed centers and mobile teams provided the immunizations. The campaign was extensively promoted (see p. L-178). At the end of the campaign

Integrating Immunization and Other Services

Most immunization programs are integrated to some degree with broader primary health care systems. Usually they are integrated at the service delivery level with maternal and child health (MCH) programs since many MCH activities, such as maternity care, nutrition, family planning, and immunization, seek to reach similar groups—women of reproductive age and their young children.

While immunization and other health services can be integrated at the highest administrative level, WHO and other experts generally recommend that top immunization management be separate from management of other health programs. Ideally, central and regional managers of the various immunization program components, including training, cold chain, surveillance, and evaluation, work only on immunization. Separate management permits managers to develop greater expertise. It also gives the immunization program more autonomy and importance (110, 433, 562).

Integration at the local, or delivery, level means that the same health workers who provide immunization also provide other services. In most countries local level integration is a necessity: there are not enough resources to support a large group of health workers who provide only immunization services.

Integration at this level has both advantages and disadvantages. On one hand, it may contribute to vaccination coverage. Children brought to health centers for other services can be vaccinated at the same time. In Botswana a 1983 program evaluation concluded that immunization coverage had increased partly because many centers also provided supplemental food for young children (525). In Zaire a 1980 evaluation concluded that mobile teams providing only immunization services worked less well and cost more than fixed facilities providing many services. In Kinshasa, Zaire, in 1980 only about 20 percent of infants immunized by mobile teams completed all three doses of DPT and OPV compared with about 65 percent of those immunized at fixed clinics (582). Since 1980 the Zaire program has been working to integrate EPI completely with other basic health care (see Table 3, p. L-185). On the other hand, where immunization is provided with curative services, the constant demand for treatment of illness and injury often leads health workers to neglect immunization. Furthermore, workers may not be well-motivated or trained to provide immunization in addition to performing other duties. Also, inexperienced health workers may have difficulty ordering and storing drugs and maintaining the cold chain (110).

At present, vertically organized immunization programs are uncommon except in Francophone Africa. A vertical program has its own budget and management, employs single-purpose supervisors and workers, and may purchase its own equipment and vehicles (110, 397). The success of the smallpox eradication campaign has been credited partly to the vertical approach used in many countries (110, 397). Intensive vaccination campaigns, such as those in Colombia, Brazil, and Turkey, may be seen as vertically organized. While these programs do use existing facilities, equipment, and health workers, most workers put aside all other duties for the duration of the campaign. This form of organization may be necessary to mount short, intensive efforts and to mobilize large numbers of volunteers and workers from outside the Ministry of Health, such as teachers or military personnel. Over the long run, however, immunization programs also need to make immunization a routine and convenient part of ongoing health services.

Family Planning and Immunization

Immunization programs should work closely with family planning programs since both are vitally important to child survival and better health. Immunization workers can help family planning efforts. The major client group for immunization programs—women with small children—also is a major group of family planning clients. In particular, immunization workers see women often during the first year of an infant's life. Thus they have repeated opportunities to discuss family planning. Immunization workers can explain to mothers that child spacing is another way to protect their children's health and that safe and effective methods of birth control are available (see **Population Reports,** *Healthier Mothers and Children Through Family Planning*, J-27, May-June 1984).

At the same time, family planning workers can help immunization programs by promoting and teaching about immunization services (see **Population Reports,** *Community-Based Health and Family Planning*, L-3, November-December 1982). In particular, they can explain to parents:

- that it is important to have children vaccinated,
- that children need specific and repeated vaccinations on a definite schedule,
- that side effects of vaccines are normal and rarely serious (18, 204, 354, 409, 415).

Family planning workers also can publicize the times and places of immunization services, and they can help mothers to understand their children's vaccination cards.

coverage of the target population was estimated at about 70 percent for measles and yellow fever and 75 percent for meningitis. The program is now building on the enthusiasm and expertise developed during the intensive campaign to reach all eligible children with BCG, DPT, and polio vaccines and all pregnant women with TT (53).

In Brazil twice-yearly national vaccination days have markedly reduced the incidence of polio. Beginning in 1980, over 300,000 workers throughout the country, most of them volunteers, immunize all children under age five with OPV on one day in June and a second day in August. Print media, radio, and TV widely publicize the campaigns. The vaccination days were started because previous immunization efforts did not provide consistently high OPV coverage, and polio outbreaks continued to occur. Since the campaigns, vaccination coverage of children under age five has exceeded 90 percent, and the incidence of polio has dropped sharply (see Figure 1) (362, 363, 364, 519). Since 1984 measles and DPT vaccines also have been administered on vaccination days. This has made the campaigns more complicated, mainly because people who can give injections have to be available and children's vaccination status and age have to be taken into account before administering vaccines. In 1984 the campaigns increased coverage of DPT and measles vaccination by about 15 to 20 percentage points to about 60 percent in some regions. The effect on disease incidence is not yet known (364, 387).

Although the impact of intensive campaigns can clearly be dramatic, it can also be short-lived unless continuing efforts are made (482, 619). Within a year after a vaccination campaign, a new group of children who need to be immunized has been born. If routine services can not immunize these children, campaigns must be repeated regularly and often, as in Brazil. One problem, reported in the Dominican Republic and Venezuela, is that mass campaigns may temporarily slow routine vaccination services. Health workers are too busy planning and implementing the campaigns. Also, the public may think that mass campaigns make routine immunizations unnecessary (336, 387). Obviously, in countries where routine services were very weak before the campaigns, this is not a concern. Another problem is that intensive campaigns can be very costly. Massive immunization efforts must be launched, and thousands of vaccinators, mobilized. Cold chain operations, record-keeping, and most other routine procedures often must be developed. Nevertheless, while overall costs are high, the cost per immunized child may be quite low (see p. L-182). Also, much of what is developed and learned from intensive campaigns can be applied to routine services.

SCHEDULING

The immunization schedule recommended by WHO is as follows (144, 541, 581):

Age	Immunizations
Birth	**BCG, OPV**
6 weeks	**DPT, OPV**
10 weeks	**DPT, OPV**
14 weeks	**DPT, OPV**
9 months	**Measles**

This schedule gives all immunizations as early as they can be effective. It protects children at very young ages, when disease would be most severe, and gives them the longest possible protection.

When EPI began operating in 1977, the schedule recommended starting the DPT-OPV series at two to three months of age, with a one- to two-month interval between doses. Also, it did not include the OPV dose at birth. Starting DPT-OPV at six weeks was first recommended in the early 1980s to provide complete protection by 14 weeks, particularly against pertussis and polio. The dose of OPV at birth was only recently recommended, in 1985, after research showed that OPV can partially protect newborns against polio (see p. L-163). Many programs are not yet providing this dose. Also, many programs still recommend giving the DPT-OPV series later—for instance, at four, six, and eight months, as in Egypt, or at three, five, and seven months, as in Guatemala (138, 447).

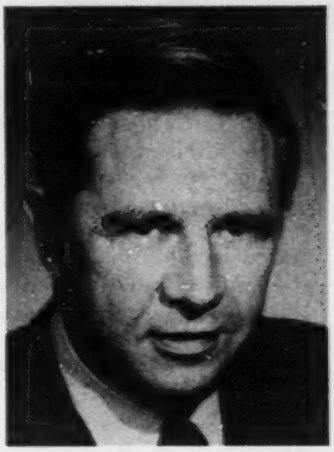
In many areas program limitations may require adjusting the recommended schedule. Many newborns have some contact with health services. Thus administering BCG and the first OPV dose usually is not difficult. Administering three doses of DPT and OPV to children between ages 6 and 14 weeks may be difficult, however, especially where services are provided mainly by mobile teams or regular mass vaccination campaigns. The intervals between doses

Victory over Smallpox: Interview

On October 26, 1977, in Merka, Somalia, the last case of naturally occurring smallpox was reported. For the first and so far the only time, a human disease had been eliminated through concerted international effort.

Over the centuries, smallpox was one of the most devastating diseases known to mankind. It occurred throughout the world, killing 20 to 40 percent of those afflicted. Except for isolated populations, virtually everyone eventually contracted smallpox. Those who survived usually were left with the disease's trademark—scarred and pitted skin—and some were blind. The smallpox vaccine, developed in 1796, was widely available from the early 1800s (see p. L-154). Even so, as recently as 1967 an estimated 10 to 15 million persons developed smallpox each year, and some two million died.

In 1959 the World Health Assembly concluded that smallpox could be eradicated, and WHO began to pursue this goal. Over the next seven years, however, little progress was made. In 1966 the Assembly provided special funds for an intensified program to eradicate smallpox in 10 years (156, 594). Through this program smallpox was eliminated from Western and Central Africa by 1970, South America by 1971, Asia by 1975, and finally, East Africa in 1977 (177, 594).



Donald A. Henderson

As WHO had forecast, the cost of eradicating smallpox was negligible compared with what was spent controlling the disease (including treating victims, mounting national vaccination programs, and managing outbreaks). Between 1967 and 1980 an estimated $313 million (US) was spent eradicating smallpox. This figure includes both international support and national input. In contrast, it is estimated that worldwide costs of controlling smallpox exceeded $1,000 million each year (594).

Much of what was learned from running the campaign can be applied to current immunization programs. Donald A. Henderson, M.D., M.P.H., Chief Medical Officer of WHO's Smallpox Eradication Unit from 1966 to 1977 and now Dean of the Johns Hopkins School of Hygiene and Public Health, discusses some of the lessons learned from smallpox eradication for this issue of ***Population Reports.***

What were the elements most central to the success of the smallpox eradication program?

There were three main technical factors important to the eradication of smallpox. First, the disease itself was easy to identify and relatively easy to contain. People with smallpox were contagious only when the characteristic rash was present. Thus outbreaks could be stopped by finding infected people, isolating them, and tracking and vaccinating their contacts. Second, in part because of the characteristics of the disease, it was not necessary to vaccinate all susceptibles. A surveillance-containment strategy was used, in which only those at risk of being in contact with smallpox cases were vaccinated. Third, the smallpox vaccine was easy to store and transport, and reconstituted vaccine could be easily administered by 15 jabs with a special bifurcated [2-pronged] needle—a technique that could be taught in just a few minutes.

There were five major management-related factors important to smallpox eradication. First and foremost, personnel: We recruited, from many different countries, generally young, energetic, good-quality people who were committed to the program. Furthermore, personnel at all levels spent at least 30 percent of their time in the field. This kept program staff aware of the practical problems faced in the field and kept them involved in developing strategies to overcome these problems.

Second, the objective of the program was defined as zero cases of smallpox instead of the administration of millions of vaccinations, as had previously been the case. Progress was then monitored in terms of reductions in the number of smallpox cases and in the number of infected countries. Progress also was monitored in terms of specific operational objectives—for instance, reducing the time it took to discover cases and to contain outbreaks.

A third element was the development of systems for quality control. The program arranged for the testing of all vaccines by WHO Collaborating Centers and used only vaccines that met international standards of potency and stability. Vaccination campaigns were regularly assessed to be certain that the vaccine "took" and that coverage met specified standards.

A fourth element was the establishment of a research agenda at the beginning of the program—research which was continued until smallpox was eradicated. This research ran the gamut from laboratory studies to improve vaccine production methods to observational studies of community participation in case-finding efforts. Most important, new findings and observations were promptly incorporated into program operations.

The last element, no less important than the others, was the fact that through WHO, an international organization, it was possible to coordinate programs throughout the world and to receive and disseminate information about all aspects of the smallpox campaign.

Which of these elements of management can be applied to the Expanded Program on Immunization?

All of these elements are crucial to the success of EPI, including that of an international agency to take the lead in coordinating efforts. Many different agencies—both international and national—are involved in EPI activities. These agencies must work together not only to tackle short-term problems but also to establish permanent systems for regularly immunizing children. The widely proclaimed goal to vaccinate all of the world's children by 1990 should, in fact, be redefined as a goal to develop systems which will serve to vaccinate all young children from 1990 onwards. Such systems, once in place, can be used to

provide other preventive health services as well as immunization—such as family planning, vitamin A, and oral rehydration therapy.

What are the differences in strategy and organization between eradication and immunization programs?

The major difference is that eradication programs are planned with an end point in mind while immunization programs are planned as a continuing effort. Eradication efforts require a greater flexibility in the use of resources to reach an end point in the shortest possible time. At the same time, they must take into account the long-term consequences of changes they may make in health systems. Continuing immunization programs must be planned to continue indefinitely and must use their resources throughout the world to develop permanent systems that can be used to vaccinate children year after year.

Do you think that integration is an important issue in developing a long-term immunization program?

Integration is one of the most controversial issues today, but thinking about it has been hopelessly confused. Many speak of primary health care as though it were comprised of a similar set of activities which are all delivered in a similar manner by a common health staff. Many programs have been organized based on this belief.

In fact, primary health care comprises quite disparate activities requiring different strategies. Curative care, for example, is actively sought by those who are ill and can be dispensed in clinics and health centers as has been traditionally the case. However, experience has shown that in such health centers curative medicine invariably takes precedence over preventive care despite the fact that it is far less cost-effective. A vivid example from the smallpox program was the fact that health centers seldom vaccinated anyone, even in the midst of smallpox epidemics. As they explained, they had too many sick people to treat—including many with smallpox—to devote time to the prevention of disease. In contrast, preventive interventions, such as immunization, are seldom sought by people. They have to be brought to the people and actively promoted. They require marketing and merchandising. Even when such programs are actively promoted, comparatively few will seek immunization if, for example, they have to make a special trip to the health center.

This suggests that preventive programs—including immunization, ORT, family planning, vitamin A administration, and malaria prophylaxis—will be more effective if organized differently from curative programs. They require community involvement through aggressive communication campaigns, including social marketing programs, and developing delivery strategies that make vaccines and the other needed commodities readily available in villages throughout a country.

What are the greatest challenges currently facing immunization efforts?

There are four major challenges to immunization programs today. First, recruiting, training, and keeping first-class personnel. Second, effectively coordinating the efforts of all agencies in developing long-term strategies and objectives for program performance. Third, obtaining support for immunization programs from top government officials and assuring that this support is translated into action at all levels of the health department. And fourth, establishing a regular system for measuring program performance, including routine assessments of immunization coverage and, most importantly, disease incidence.

What diseases are currently the best candidates for eradication? Why?

Based on experience to date, the most likely candidate for eradication is polio. Transmission of wild poliovirus has been stopped in most industrialized countries and has been sharply reduced throughout the Americas. Accordingly, the Pan American Health Organization has recently set a goal of eradicating polio from the Western Hemisphere by 1990. The major questions that need to be answered before a worldwide polio eradication effort can be launched are: (1) does oral polio vaccine work sufficiently well in tropical regions to stop transmission and (2) what are the best strategies to use and how do we monitor the circulation of poliovirus? Those questions should be answered within the next three or four years.

Although some experts feel that measles also can be eradicated, I do not. One only has to look at the situation in the US, where measles transmission has not yet been stopped despite almost two decades of effort. If measles cannot be eliminated from the US with all its health resources, it is unlikely to be eliminated from developing countries.

What were the major contributions of the smallpox program to immunization programs in general?

A major contribution of the smallpox program was that it significantly enhanced WHO's credibility and prestige and served to pave the way for the Expanded Program on Immunization as well as other WHO programs.

Second, the smallpox program set a precedent in that, for the first time, vaccine standards were monitored internationally by independent quality-control laboratories. This system is now used for EPI vaccines.

Third, management of the smallpox program was organized around results obtained through surveillance systems. Targets were established, and performance was judged by progress towards these targets. This approach was an extremely effective management tool and can be applied in other programs.

Fourth, the smallpox program made many health ministries aware of the considerable talents and capabilities in their health systems and prompted them to attempt other programs, including immunization programs. I must note that the achievement of smallpox eradication must be attributed primarily to developing country health personnel. At any one time only about 100 WHO smallpox personnel were working in the field. Furthermore, smallpox was eradicated with international support that amounted to only about $10 million per year.

Last, the smallpox program brought many young, talented people into the health field—both on the international and national levels. Many of these people continue to work in immunization, and it is through their efforts that many effective programs are being established.

of DPT-OPV may have to increase; perhaps the third dose may have to be given along with measles vaccine. In general, where children do not have ready access to health services, vaccinators should be told to give DPT and OPV at any time during the first year of life after age six weeks, as long as there is at least four weeks between doses, and to administer measles vaccine at any time after age nine months (89). A major risk of departing from the recommended schedule is that infants may be left susceptible to pertussis for much of their first year of life. The series of all three DPT doses is probably needed for full protection (see p. L-160).

A quite different immunization schedule has been tested in parts of Burkina Faso, Mali, and Senegal. The schedule involves only two contacts with children, usually through mobile teams: one when children are 3 to 8 months old, to administer BCG and a first dose of DPT combined with inactivated polio vaccine (IPV), and another six months later, when children are 9 to 14 months old, to administer measles and yellow fever vaccines and the second dose of DPT-IPV. The schedule is being tried because of the problems of providing immunization to rural people in West Africa, some of whom are difficult to reach for up to five months during the rainy season. IPV was used because: (1) Some research suggests that IPV may be more effective than OPV in some tropical areas; (2) IPV may require only two doses, whereas OPV requires three or four; (3) IPV is less affected by heat than OPV; and (4) IPV can be administered in combination with DPT (402).

Results from a few districts in Senegal and Burkina Faso suggest that the abbreviated schedule has permitted broader coverage. For instance, in 1985 in Kolda, Senegal, after five years of experience the program had achieved coverage levels among children 3 to 14 months of 68 percent in rural areas and 80 percent in urban areas. Costs were less than $7 (US) per immunized child (402, 403).

Providing immunizations on this simplified schedule probably protects many children from EPI diseases. Blood tests revealed that over 90 percent of children had produced antibodies against tetanus, diphtheria, the three polio strains, and measles (402). The impact on disease incidence is not known, however. This schedule clearly is not ideal since infants are left vulnerable to pertussis and polio until they are at least nine months old.

Drop-Out Rates

No matter how well-organized a program, it is difficult to make sure that all children complete full vaccination schedules. Drop-out rates of 50 to 75 percent after one or two doses of DPT and OPV are common (160). An intensive immunization program in a region of Ghana, for instance, achieved 63 percent coverage for the first dose of OPV, but only 22 percent for the second dose and 11 percent for the third dose (477).

A major reason for high drop-out rates is parents' lack of knowledge about when and where vaccinations are offered and what vaccinations children need. In Rwanda in 1983, for instance, a survey of 150 mothers whose children were not fully immunized revealed that about three-fourths did not know the dates of immunization sessions (531). Good communication and clear vaccination cards are crucial to overcoming this problem (see p. L-179).

In many areas another major problem is that health personnel often do not vaccinate sick children. For instance, in Jordan a 1982 evaluation found that clinics refused immunization to children with any illness (most often fever or diarrhea) (443). Sick, weak, and/or malnourished children are particularly in need of vaccination since they are most at risk of death or severe complications from vaccine-preventable diseases. In general, sick children respond well to vaccines and have no greater risk of side effects. Immunization workers should be told to immunize all children except those who have severe illnesses that require hospitalization (127, 494). Even these children should probably be immunized before they leave the hospital.

Other reasons parents cite are:

- Too far to travel,
- Vaccination team did not arrive when scheduled or had run out of vaccine,
- Feared side effects,
- Thought children had already had the vaccine-preventable disease,
- Lost the child's vaccination record,
- Previously received poor service, such as too long a wait or vaccinators unsympathetic to frightened children (14, 33, 110, 477, 511).

THE COLD CHAIN

The cold chain is the system that assures that vaccines are kept below 8°C during transport from the manufacturer to the people to be vaccinated. The cold chain is necessary because vaccines lose their potency when exposed to high temperatures. Successive exposures have a cumulative impact on vaccine potency, and, once lost, potency cannot be restored.

Vaccines used by EPI vary in their heat stability—that is, their ability to retain potency at differing temperatures. Tetanus toxoid (TT) withstands higher temperatures best, followed in decreasing order of stability by DPT (the pertussis component is the least heat-stable of the DPT components), BCG, measles, and oral polio vaccines.

The EPI vaccines can be divided into two groups in terms of optimal storage temperature. The killed vaccines, DPT and TT, should be kept just above freezing, at 0° to 8°C, according to new WHO recommendations (249). Both can be inactivated by temperatures lower than 0°C. The other vaccines should also be kept below 8°C, but they are not damaged by freezing. BCG vaccine, a live bacteria vaccine, is sensitive to ultraviolet light as well as heat and therefore is packaged in colored vials (139). The live virus vaccines against polio and measles are especially heat- and light-sensitive. For long-term storage they are frozen at −20°C. For short-term transport and storage, temperatures up to 8°C are acceptable. EPI cold chain requirements permit different temperature ranges for vaccines during different phases of transportation and storage (see Table 2).

Levels of the Cold Chain

A typical cold chain consists of four levels:

- the central store, located in the national capital or other major city;

Table 2. Current EPI Requirements for Vaccine Temperatures (in Degrees Centigrade) and Maximum Lengths of Storage

Vaccine	Transport from Manufacturer to Central Store*	Storage in Central Store	Transport to Region	Storage in Regional Store	Transport to Health Center	Storage in Health Center	Transport to Vaccination Location
Measles	≤8°	2 years at −20°	−20° to 8°	3 months at −20°	−20° to 8°	1 month at −20° to 8°	1 week at 0–8°
OPV	≤8°	2 years at −20°	−20° to 8°	3 months at −20°	−20° to 8°	1 month at −20° to 8°	1 week at 0–8°
BCG	≤30°	8 months at 0–8°	0–8°	3 months at 0–8°	0–8°	1 month at 0–8°	1 week at 0–8°
DPT	≤30°	1½ years at 0–8°	0–8°	3 months at 0–8°	0–8°	1 month at 0–8°	1 week at 0–8°
Tetanus	None	1½ years at 0–8°	0–8°	3 months at 0–8°	0–8°	1 month at 0–8°	1 week at 0–8°

*In 48 hours or less

Source: Carrasco (626), Henderson (158), WHO (485, 505)

- the regional store, located in a major provincial city;
- the health center store, often located in a large town;
- the local health post or other location where vaccinations are given.

Breaks in the cold chain may occur at each of these levels. To reach their final destinations, vaccines may have to be carried over bad roads, passable only by bicycle or motorbike or on foot (530), and then stored in places with unreliable electrical power supply or kerosene-fueled refrigerators. In addition, staff at the health center and health post levels often have many duties and cannot continuously supervise vaccine storage (505). At every level of the cold chain, the key elements are: (1) established procedures for transport, storage, and monitoring of the vaccines, (2) trained, well-supervised personnel able to manage and monitor vaccine distribution according to established procedures, and (3) well-maintained equipment to store and transport vaccines at the proper temperatures (413, 461, 505, 605).

The **central store** receives and stores large quantities of vaccine, generally for no more than two years. Necessary equipment at the central level includes a walk-in cold room or several refrigerators capable of maintaining temperatures of 0° to 8°C as well as freezers capable of maintaining −20°C. Monitoring devices—thermometers or thermorecorders—are needed to provide a continuous record of storage temperatures. There also should be an alarm system to warn of high temperatures and, most importantly, a back-up power supply that starts automatically if the line current is interrupted (89, 110, 413, 505).

Although cold chain failure is less likely at the central level than at lower levels, any failure there can be catastrophic because large quantities of vaccine are in storage. A central store may contain as much as $500,000 (US) worth of vaccine, and a single international shipment received by air might be worth $50,000 to $100,000. In contrast, a breakdown at a local center might mean a loss of only $50 worth of vaccine (505, 626).

A 1980 evaluation of the cold chain for measles vaccine in Chile indicates the types of problems that can occur at the central level. At the airport some shipments were left unrefrigerated because the program was not promptly notified when vaccine arrived, and there was no cold storage equipment. Receiving personnel at the airport did not record either vaccine temperature at the time of receipt or the total time that the vaccine was unrefrigerated. Shipments were further delayed because customs clearance had not been obtained in advance. At the central store itself there were no cold rooms or freezers exclusively for vaccines, no permanent system for monitoring temperatures, and no back-up power supply (57). These deficiencies may help to explain why a measles epidemic occurred in 1979 despite a high level of vaccination coverage.

Regional stores receive vaccine from central stores and distribute it to surrounding health centers. Because temperatures may be less controllable at regional and subsequent levels, no more vaccine should be sent to regional stores than will be distributed within a few months. EPI standards specify that regional stores should receive vaccine once every one to three months and store it no longer than three months (505, 626, 643, 644). Vaccine is usually carried from the central to the regional store either in refrigerated vehicles or in cold boxes—insulated containers that use ice packs to maintain temperatures below 8°C. Regional stores have thermometers—and ideally thermorecorders and alarm systems—in the refrigerators and freezers used for vaccine storage (89, 108, 110, 505, 556).

Health center stores, typically located in large towns that may or may not have electricity, supply vaccine to surrounding health posts or other vaccination locations. Vaccines should be stored at health centers no longer than one month, according to EPI standards (505, 626). Vaccine usually is transported from the regional store to the health center in cold boxes and then stored in a refrigerator. If the health center supplies local health posts, the center needs a freezer to produce ice packs for cold boxes. Ideally, centers freezing more than 20 ice packs per day should have special large ice pack freezers (556, 626).

Maintaining appropriate storage temperatures in health center refrigerators has been a recurring problem. Because no other refrigerator is available, health center staff may store food in refrigerators intended for vaccines. When this is done, refrigerators are opened often, allowing the temperature to rise and increasing strain on the refrigeration equipment. To discourage such improper use, EPI training courses emphasize that refrigerators should be used only for vaccine storage (600). Also, EPI provides stickers with such messages as "STOP! Do you need to open it?" that can be placed on refrigerator doors. Finally, EPI encourages programs to buy top-opening refrigerators, which maintain safe temperatures better than front-opening models (89, 289).

Vaccines are carried to the **local level** or vaccinator in small cold boxes or in vaccine carriers—small insulated containers. Vaccines can generally be stored in these containers for one to two days (549). If possible, vaccine delivery and vaccination sessions should be coordinated. To

keep vaccines as cool as possible during sessions, vaccinators should keep vaccine containers out of direct sunlight and open them only when needed. They should take out only one vial of each type of vaccine at a time and place the vial either in a cup of ice or, if available, in a special ice pack with holes for the vials. After vaccination sessions vaccinators should destroy all opened vials and return to the health center all unopened vials that have been kept cold (89, 626, 647).

Despite the emphasis that UNICEF and WHO have placed on the cold chain and on cold chain technique and equipment, cold chain failures continue to plague immunization programs throughout the world. Equipment shortages are a problem in many countries. For example, in Venezuela a 1984 program review found that more refrigerators and freezers were needed at regional facilities and that central stores did not have automatic temperature-control devices (534). In other countries observers have reported improper cold chain procedures to be a major problem. In Mexico, for example, a 1985 evaluation found that EPI personnel often did not record temperatures in refrigeration equipment, especially on weekends and holidays, and that vaccine often was poorly monitored during transport (238).

Cold Chain Equipment

Conditions in developing countries put special strains on cold chain equipment: electrical power is often unreliable; tropical heat and humidity shorten equipment life; and spare parts and trained repair personnel are scarce (89, 413, 554, 556). Where electricity is not reliable, kerosene- or propane-fueled refrigerators are generally used. Kerosene and propane are often expensive or unavailable, however, and kerosene is often of low grade or polluted. Under field conditions kerosene refrigerators need careful and frequent maintenance—as often as once a day—especially when operated on poor fuel. Three main strategies have been used to assure that cold chain equipment works properly under these difficult conditions: (1) regularly testing currently available equipment; (2) modifying existing equipment to work better in tropical conditions; and (3) developing new equipment (556).

WHO tests samples of cold chain equipment at facilities in Denmark, Colombia, Sweden, and the United Kingdom. Descriptions of all equipment found adequate for tropical countries are included in Product Information Sheets available from UNICEF and WHO and published in English, French, and Spanish (592).

Existing equipment modified to work better in tropical conditions includes: refrigerators lined with ice, kerosene refrigerators with unbreakable lamp glass, and kerosene refrigerators regulated by thermostats (556). Ice-lined refrigerators are valuable where electrical power is unreliable. These refrigerators are lined with water-filled tubes. The water freezes when the power is on. When the power fails, the ice keeps the vaccine cold (413). An ice-lined refrigerator can be used either as a refrigerator or a freezer, an important versatility for regional stores. A further advantage is that these refrigerators consume much less electricity than most others (488, 489, 556).

Several important types of new equipment have been developed especially for the cold chain:

LOOK AFTER YOUR VACCINES
EVERY DAY!
write the location
WHERE IS THE NEAREST EMERGENCY REFRIGERATOR ?
WHERE IS THE NEAREST SUPPLY OF ICE ?
WHERE IS THE NEAREST REPAIRMAN ?

A WHO EPI poster reminds health center staff of the daily responsibilities involved in maintaining the cold chain. Other posters illustrate the tasks that must be performed weekly and monthly.

- New health center refrigerators are essentially stationary cold boxes with refrigeration units attached. These units can operate on kerosene, gas, or electricity, depending on what is available. These units are now widely used (556).
- Solar-powered refrigerators and ice pack freezers have the potential for better performance, lower operating costs, longer life, and greater reliability than conventional refrigerators. As yet they remain unproven, however (413, 442, 547, 556).
- A number of improved, less expensive cold boxes and vaccine carriers are now available. Competition among manufacturers has led to dramatic price reductions and better performance (556).

Cold boxes have helped programs to expand coverage. They cost one-third as much to buy as refrigerators and require almost no maintenance. Also, they last indefinitely, while in a tropical climate refrigerators have to be replaced every two or three years. Furthermore, because they do not break down, cold boxes save vaccine. These cost savings can be put to use providing wider coverage. Most importantly, because they are portable, cold boxes enable programs to take vaccines to places having no refrigerators.

Results of a model project in Nigeria illustrate the role of the cold box. Nigeria's cold chain performance had been poor. Refrigerator breakdowns at the health centers had led to repeated cold chain failures. In 1982 UNICEF, along

with WHO and the Nigerian Ministry of Health, launched a model vaccination project in Ondo State. A key element of the project was much more use of cold boxes and less reliance on refrigerators. The cold box approach, in combination with careful management and supervision, produced dramatic results. When the project began in March 1983, only 9 percent of children between one and two years old were fully immunized against all six EPI diseases. Full coverage rose to 62 percent by June 1984 and 83 percent by August 1984 (359).

Another important new development is a universal spare parts kit. These parts can be used to repair 90 percent of the refrigerators in use (442).

Monitoring Vaccines in the Cold Chain

Since any exposure to excess heat damages vaccines, handling procedures and refrigeration equipment must be carefully monitored at all times and at all levels. As noted, recording thermometers and alarm systems monitor major storage facilities. In addition, the vaccines themselves are monitored in three ways: (1) by regular testing of new batches from manufacturers, (2) by testing of samples as requested by national programs, and (3) by new chemical time and temperature monitors attached to vaccine shipments.

WHO has established international standards for the quality of all vaccines purchased by or donated to WHO and UNICEF. WHO-certified laboratories have been set up to test vaccine from manufacturers. They also retest vaccine at the request of program managers who suspect that a batch of vaccine has lost potency. This quality control system was originally established by the WHO smallpox eradication program (see pp. L-172–173). Laboratory testing is costly and time-consuming, however, and often requires sending vaccine samples out of the country. Therefore it is done only when special problems are suspected, such as when cold chain failure may have spoiled large amounts of vaccine, or when a disease outbreak occurs in an apparently well-immunized population (158, 160, 317, 330, 505).

Originally developed for the food industry to monitor distribution, time and temperature monitors use chemicals that change color as time passes. The color changes more slowly when temperatures are low, more quickly when they are high. The manufacturer affixes the monitor, and, as the vaccine passes through the cold chain, personnel can readily assess total heat exposure and time elapsed (442, 497, 565, 566). These monitors are a simple way to monitor vaccine potency. Also, they make cold chain supervision easier. An evaluation of the cold chain in Tunisia found that staff saw monitors as "silent supervisors," suggesting that their use led to better handling of vaccines (539). Various monitors are available, including one from the Program for Appropriate Technology in Health (PATH) (413).

COMMUNICATION

Many of the most effective immunization programs have included aggressive communication activities. It does little good to provide immunization services unless parents are convinced that immunization is valuable, know where and when services are available, and understand when children should receive vaccines.

Evidence from programs shows that communication efforts do increase coverage (201, 388, 465). For example, in the Yemen Arab Republic in 1980 and 1981, during a television campaign for immunization the number of DPT and polio immunizations increased to twice the previous monthly average. Moreover, the demand for immunizations remained high for several months after the television campaign (495).

Three components of communication strategy need specific attention:

- **Audiences.** The main audience for immunization programs is parents of young children. Others who need to be reached even before programs begin include national and community leaders.
- **Messages.** Messages about immunization need to perform a dual role: first, to create public awareness and support and, second, to provide the specific information that people need in order to use immunization services.
- **Communication channels.** Mass media can reach the most people, but person-to-person communication and other strategies are important to reinforce these media, especially when providing specific information.

In general, intensive immunization campaigns, such as those in Brazil, Burkina Faso, Colombia, El Salvador, and Turkey, have carried out the most systematic, wide-reaching communication efforts. They have used a variety of media and have mobilized national and community leaders as well as entertainers to tell people about immunization and the services provided during the campaign. In contrast, continuing immunization services have carried out few communication activities. Clearly, it would be impossible to promote immunization continuously at the same level that short-term campaigns do. Nevertheless, most continuing services could increase immunization coverage and reduce drop-out rates through more extensive, more effective communication.

Developing Communication Strategies

To develop effective messages that will influence the intended audience—mainly parents with young children—research is necessary on the audience's attitudes, beliefs, and experiences. In Peru, for example, research showed that many mothers did not believe that vaccine-preventable diseases could be fatal. As a result, messages were designed to stress the seriousness of the diseases, such as a TV spot dramatically showing the burial of a small child. Research also found that Peruvian mothers thought a mature woman doctor was the most credible source of information. Accordingly, TV and radio promotions featured women doctors talking to mothers at a health center (12).

In Kenya workers in a rural health project referred to a common local experience to overcome one of the most difficult problems in promoting immunization—communicating the concept of immunizing healthy children to prevent an illness that might or might not occur later. Workers compared immunization to using a banana leaf to protect against rain. If a person outdoors sees that rain is likely and wants to stay dry, before the rain starts he picks

a banana leaf to use as an umbrella. If he waits until the rain begins, he may get wet. Likewise, if a parent waits until children become ill before having them immunized, they will not be protected. The banana leaf analogy was also used to explain the possibility of vaccine failure. If a person picks a leaf with a hole in it, he may still get wet, but this does not mean that all banana leaves (or vaccinations) are useless. During the first three years using the banana leaf theme, the number of children brought for immunizations increased fourfold, even though some mothers had to carry their children more than 10 miles to the nearest health center (434).

The most effective messages for creating public awareness are simple, appealing, and convey a single idea (229). For example, in Ecuador a 2-year national campaign for better child health focuses on the importance of child survival for Ecuador's future. Among the communication activities launching the campaign in October 1985 was a song—"Raise Up Your Spirits, Ecuadorean"—written by one of the country's foremost songwriters and recorded by 40 leading Ecuadorean vocalists. They sang, "Never permit youth, our future, to die." Some 550,000 children were immunized during the first month of the campaign (393). Similarly, from September 1984 to April 1985 a campaign in Peru used the concept of responsible parenthood and the slogan, "Healthy child today, healthy Peru tomorrow." Within this broad theme, specific messages promoted family planning, immunization, and ORT through radio, TV, and print media. The overall message of the campaign was that responsible parents decide to have only the number of children they can raise properly, have those children vaccinated, and give them oral rehydration solution when they have diarrhea (12, 51).

In addition to research on audiences and messages, research is needed on the outreach and impact of different media and the best mix of mass media and person-to-person communication. In most countries mass media reach an increasing proportion of the population and are the most efficient way to create public awareness. Radio now reaches most rural areas, television coverage is expanding, and literacy is much higher, especially among young women (133, 229). These trends make it easier to promote immunization and other health care measures. In every country or region, however, communication experts need to know which stations or programs are most popular, when people listen, and other relevant data so that they can use the mass media most effectively.

Mass media can promote immunization through paid announcements, through public service messages or announcements, or indirectly through news coverage. When vaccination days are well publicized in mass media, the impact is substantial. For example, in El Salvador three National Vaccination Days in 1985 were heavily publicized on radio, television, and print media. More than 200,000 children were vaccinated on each vaccination day (135, 165). In Colombia the mass media provided extensive news coverage for the 1984 National Vaccination Crusade. On each of the three vaccination days more than 800,000 children were vaccinated (105).

Programs need to evaluate communication strategies periodically to detect any problems and to change messages and media if needed. For example, in Zambia an analysis of 1965-72 coverage data found that dropout rates were high—a persistent problem for most immunization programs. Research showed that many Zambian mothers did not understand the need for repeated doses. As a result, health center staff shifted their counseling of mothers to focus on the concept of the fully protected child. The percentage of children receiving all doses of vaccine increased considerably (388).

Mobilizing the Community

Involving the nation's highest political leaders in support of immunization can create a powerful symbol of a nation's commitment to immunizing children. For example, in Turkey, to launch a UNICEF-assisted intensive immunization effort, the Prime Minister immunized the first two children at a public ceremony (42, 135). National leaders also have actively promoted intensive immunization efforts in Colombia, Ecuador, El Salvador, and other countries (134, 135, 418, 638). To involve political leaders, of course, proponents of immunization must convince them that immunization is effective and important and will bring credit to those who support it. Community leaders and other influential persons also can help publicize the benefits of immunization, as can community organizations, including schools, churches, women's groups, political parties, and labor unions (53, 73, 134, 135, 286, 362).

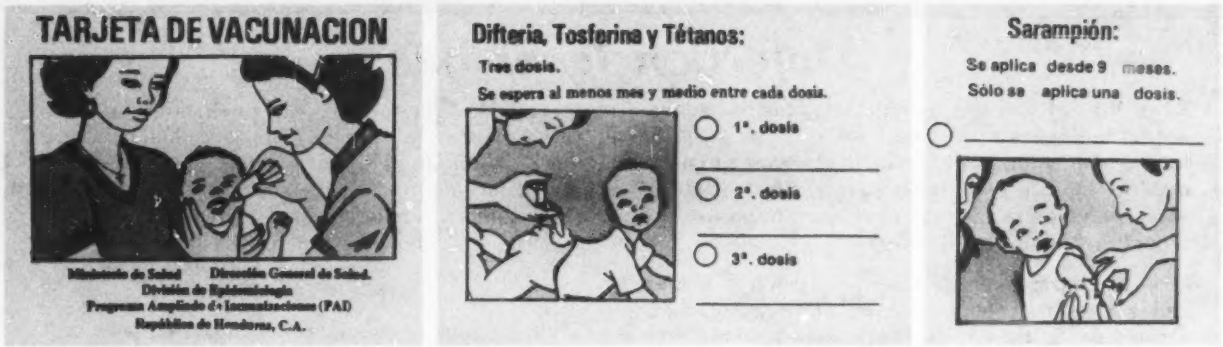
The Vaccination Commando campaign in Burkina Faso shows what can be accomplished when a society mobilizes support for immunization from the national to the local level. At the national level, a committee of teachers and audiovisual experts designed information and education materials and coordinated all communication activities. At the provincial level, vaccination committees organized meetings to discuss immunization and even produced plays about immunization, combining entertainment with education. At the local level, leaders went from door to door telling parents about the benefits of immunization and where and when it was available. The campaign used radio, television, and posters as well, but most parents bringing children for vaccinations said that they heard about immunization from local leaders (53, 135). National mobilizations for immunization can have the added benefit of alerting the entire populace, including national leaders and other health care policy-makers, to the importance of preventive health measures. This can create opportunities for advances in related health fields such as family planning and oral rehydration therapy (633).

Specific Information for Parents

In addition to understanding the value of immunization, parents and prospective parents need to know where and when immunizations are available, who should receive them, and when specific immunizations should be obtained. When parents bring their children for immunization, they should learn:

- how many doses are necessary for full protection and when they should bring their children back for the next dose,
- what the common side effects are and that they are usually no cause for alarm and show that the vaccine is working (110).

In many countries person-to-person communication has proved best to provide specific information. In Burkina



The new Honduran vaccination card is actually a small 6-page picture booklet especially designed for parents to understand easily. Each page shows a different vaccine being given and indicates how many doses are needed. The cover (left) shows a baby being given OPV. The page for DPT (center) emphasizes the need for three doses. The page for measles (right) calls for one dose at nine months of age.

Faso, El Salvador, Guatemala, and Pakistan, clinic personnel, outreach workers, or community volunteers have told families what immunizations their children need and where and when they are available. In Colombia a strategy called channeling was developed. Before national vaccination days, volunteers from various groups, including the Red Cross, Civil Defense, and Boy Scouts, visited households to locate unvaccinated or incompletely vaccinated children. These children were then "channeled" to a vaccination session: their parents were told where and when children could be vaccinated. Channeling has since been successful in a number of other countries (73, 105, 372).

Vaccination cards for each child are an important communication tool to provide specific information—if parents understand them. In 1983, research in Honduras found that many mothers were unable to tell from the cards which vaccines their children had received, how many doses had been given, or how many were still needed. Thus the cards did not remind parents to return when needed. Researchers learned that mothers recognized vaccines by the way they were administered—that is, orally or injected in the arm or the buttock. Also, information was easier to understand when only one vaccine was discussed at a time. Based on these findings, the old card was replaced with a small booklet. Each page depicts a different vaccine being administered. Circles next to each picture show the necessary number of doses. The booklet is small enough to be carried in a small plastic bag inside a woman's brassiere—the traditional way that Honduran women carry personal documents. Field tests showed that both literate and nonliterate women understood the booklet much better than the old card (623) (see photo, this page).

TRAINING AND SUPERVISION

Personnel in immunization programs perform a wide variety of tasks ranging from communicating with clients to carrying out complex technical procedures. Training personnel to carry out those tasks and supervising them as they do so are essential to the success of immunization programs. WHO, PAHO, and UNICEF have developed courses and training materials to teach supervisory and operational skills at all levels. In addition, several countries have established their own training programs.

Training

The first EPI training course was held in 1977. Since then over 15,000 health workers have attended EPI courses sponsored by UNICEF, WHO, or PAHO. Almost 300,000 other workers have been trained in national programs using EPI course materials (481).

Schools of public health can play an important part in national training programs. Since 1980 several Latin American countries—including Belize, Ecuador, and Peru—have established EPI training programs in schools of public health. In Brazil the National School of Public Health in Rio de Janeiro has produced training materials on EPI disease surveillance and since 1983 has conducted state and local courses using these materials (295, 500).

Much of EPI training has focused on management skills. EPI management courses—developed by WHO with the help of the US Centers for Disease Control—now cover all aspects of upper- and middle-level management. Upper-level courses cover specific management skills, such as setting national and regional program goals and organizing disease surveillance. They also cover various technical aspects of immunization, including the cold chain, to prepare managers to supervise field personnel.

Courses for middle-level managers focus more directly on practical skills and prepare participants to teach those skills to their workers. The basic course consists of nine modules, which may be used individually or in any combination depending on local needs. The modules, available from PAHO and WHO, cover all aspects of program management, including allocating resources, managing the cold chain, evaluating vaccination coverage, supervising performance, and conducting disease surveillance (596).

Courses also have been developed to train the field workers who conduct vaccination sessions. To ensure that all children needing immunization are properly vaccinated with potent vaccine, field workers must learn to: (1) explain the benefits and possible side effects of immunizations, (2) determine who should be immunized and recognize contraindications for vaccination, (3) use proper sterilization and vaccination techniques, (4) ensure that vaccines are kept at the proper temperatures, and (5) keep complete and accurate records. Courses designed to teach these skills emphasize practical exercises and include materials to help teachers plan courses and workshops (110, 160, 569). Prospective workers should receive hands-on training just before they take up their duties.

Injection Technique

All of the EPI vaccines except OPV must be administered by injection. All injections must be given by trained staff using sterile equipment. Many programs need to improve both training in injection technique and supervision of vaccination sessions to ensure that proper procedures are followed.

Lack of sterilization or improper sterilization of needles and syringes has been a major problem in many immunization programs. Whether because personnel do not have time to sterilize reusable needles properly, because they reuse needles that they should throw away after one use, or because they do not understand the importance of sterile injection equipment, workers have often been seen using unsterilized or improperly sterilized needles (160, 413, 442, 447, 580).

Using unsterilized needles can spread hepatitis B and other viral infections. Also, questions have been raised about whether LAV/HTLV-III, the virus that causes Acquired Immune Deficiency Syndrome (AIDS), also could be spread this way (479). Responding to this concern, WHO has stated:

> Thus far, there has been no demonstrated transmission of LAV/HTLV-III as a result of immunization. Since the possibility exists that unsterile needles and unsterile syringes can transmit not only LAV/HTLV-III, but other infectious agents including hepatitis viruses, immunization programmes have the obligation to ensure that a sterile needle and a sterile syringe are used with each injection. (479)

In addition to making sure that all immunization equipment and containers are sterile, workers must wash their hands often, avoid touching nonsterile surfaces, and use forceps to handle needles. Workers' hands should never touch needles during vaccination sessions (569, 611).

During vaccination sessions only one vial of each vaccine should be opened at a time. At the end of the session, any vaccine remaining in the open vial and the vial itself should be destroyed, according to EPI standards (611). Nonetheless, personnel should not hesitate to open a new vial even if only one child remains to be vaccinated. In Egypt, for example, a 1984 evaluation team concluded that workers in many health centers needed more supervision and training because they often did not follow these standards (447).

Types of Equipment

There are three types of injection equipment—reusable syringes, disposable syringes, and jet injectors:

- Reusable glass or plastic syringes with steel needles are most often used. They work well, are cost-effective, and are safe when properly sterilized. To sterilize needles and syringes completely, one of the following procedures **must** be followed:

  Sterilize in pressurized steam (in an autoclave or pressure cooker) for 20 minutes

  or

  Sterilize in boiling water (100°C) for 20 minutes (where steam sterilization equipment is not available) (331, 550).

- Disposable needles and syringes are convenient, but they add to the cost and quantity of supplies that must be distributed and stored. In addition, although they are not meant to be reused, they often are, and without satisfactory sterilization. Specially designed needles and syringes that cannot be reused have been tested but are currently too expensive for widespread use (413, 442).
- Jet injectors force vaccine through the skin in a pressurized spray. They are fast, easy to use, and it had been thought that they avoided the risk of infections due to unsterilized needles. Recent evidence suggests that they may transmit some infections, however (624). In addition, they need regular maintenance, which is often difficult to provide. Also, because they are expensive to buy, jet injectors may be cost-effective only when used in mass immunizations (413, 442).

An important point to be made in training is that children should be vaccinated even if they have minor illnesses. In many programs health workers are reluctant to vaccinate sick or malnourished children (456) and turn them away from vaccination sessions, even though such children are among those who most need immunization (127, 494) (see p. L-174).

Among the most important EPI courses are those on the cold chain. Yet program evaluations have shown that in many programs personnel have had little or no training on cold chain procedures. Cold chain courses have been designed for personnel at all levels—vaccinators, repair technicians, supervisors, and directors of health centers. They teach such skills as:

- Handling vaccines properly at regional, district, and local levels,
- Estimating vaccine supply needs,
- Properly storing and distributing vaccines,
- Calculating equipment needs, and
- Ordering and using equipment.

Various audiovisual materials are used in cold chain courses, including films, slides, and a cold chain game. The game asks students to solve simulated problems that can occur in distributing vaccine, such as shortages, expired vaccine, and refrigerator breakdowns (503, 556, 597). In addition, specific courses teach basic refrigerator maintenance and repair to technicians.

Supervision

A good system of supervision is essential to a successful immunization program. People always work more carefully when they know that their performance is being evaluated. Supervision of immunization personnel is especially important because of the wide range of important tasks that field personnel must perform.

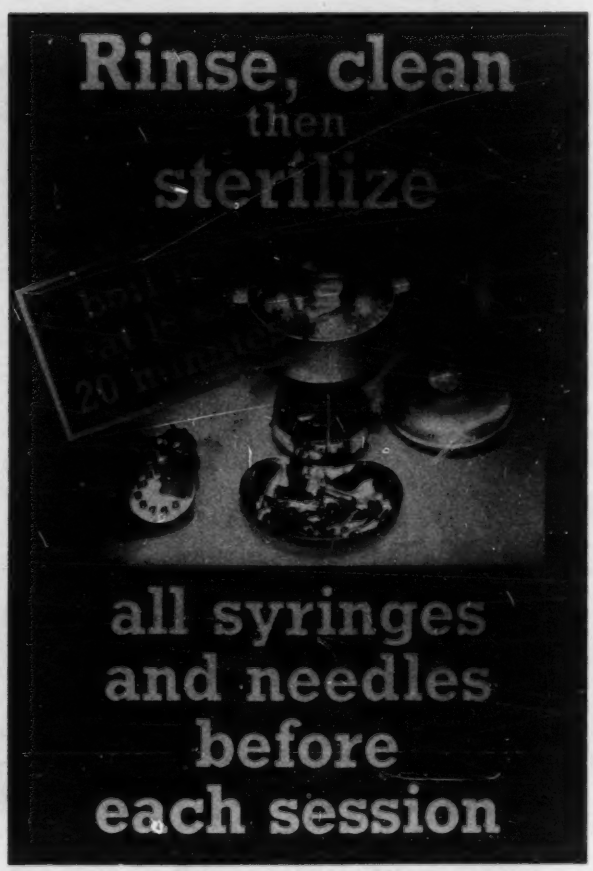
Essential to good supervision are:

- Sufficient funds for supervision at all levels,
- Frequent supervisory visits to the field,
- Written job descriptions specifying performance standards for all tasks,

- Check lists to guide supervisors in evaluating performance,
- Recognition by supervisors of good performance,
- Investigation to determine reasons for poor performance and to develop strategies for improvement,
- Standardized training programs for supervisors (614, 628, 630).

Many programs have given supervision low priority or have been hampered by a shortage of funds. Consequently, supervision systems in many countries are inadequate. In Egypt, for instance, a 1984 evaluation noted that there were no personnel specifically hired to supervise immunization workers. Physicians in charge of local health clinics usually were assigned the task, but they often had too many other duties to supervise vaccinators adequately (17). In the Dominican Republic evaluators in 1982 found that funding for supervision was not sufficient. Supervisors did not have enough money to buy fuel for their vehicles, and many were waiting for per diem payments earned months before (289). Lack of money also makes it difficult to hire and retain qualified staff, who often can make more money in other jobs (537).

Regular—but not predictable—supervisory visits to all facilities are especially important. Frequent face-to-face contact enables supervisors to identify and correct poor performance before major problems develop, helps prevent staff complacency, and gives workers opportunities to ask questions and share ideas with supervisors. Yet field visits should not be scheduled so regularly that workers can make special preparations and supervisors do not get an accurate view of day-to-day operations. It is important during field visits that supervisors recognize and encourage good work and take immediate action to correct poor work. When workers make mistakes, a simple explanation of proper procedure may be all that is needed. In other cases supervisors may decide that workers should attend refresher courses (614). Regular staff meetings are another important way for supervisors to keep in touch with their staffs. In Belize, for example, monthly regional meetings allow public health nurses and their supervisors to discuss problems in providing immunization services at local clinics (34).



Evaluators report that local health workers often do not completely sterilize injection equipment between uses. This poster from WHO EPI promotes correct sterilization techniques.

Although staff meetings and visits to immunization posts provide much essential information, supervisors also need written reports from the field. Such reports should accurately describe local vaccination coverage and disease incidence, as well as any problems in providing services. Supervisors should make special visits to observe facilities not sending regular reports (614).

Supervisors need check lists of performance standards covering all essential tasks. For example, one suggested supervisory check list for monitoring a vaccination session reminds supervisors to assess how staff:

- ☐ monitor vaccine quantities, storage temperatures, and handling procedures,
- ☐ screen children brought for vaccination,
- ☐ sterilize needles and syringes,
- ☐ give injections,
- ☐ tell mothers about vaccination side effects and the need to return for future doses, and
- ☐ show courtesy and consideration to mothers and children (630).

EPI training manuals describe check lists for monitoring various program activities, including inventory control, record-keeping and reporting, vaccine transport, and planning for immunization sessions (569, 614, 643).

COSTS OF IMMUNIZATION

Fully immunizing a child in the developing world against the six EPI diseases costs between $5 (US) and $15 (160). Thus, in a country with a total population of 50 million and about 1.75 million births per year, the annual cost of immunizing all infants would be between $8 million and $26 million. On a per-client basis, the costs of immunization programs are similar to those of family planning programs and other basic health services.

Cost per immunized child varies according to such factors as whether the population is mostly rural or urban, the diseases targeted, the delivery strategies used, and the size of the population to be immunized. While providing services through established clinics in urban areas can cost as little as $2 to $3 per immunized child, providing services to remote areas can cost as much as $40 or $50 per child (367, 368, 452, 453, 459, 640, 641). The estimated cost of immunizing pregnant women with TT is $1.50 to $3.50 (117).

Costs in 11 national programs can be summarized as follows (117):

Program Component	Average % of Total Cost (Range in 11 Programs)
Recurring costs	77% (70-86%)
Salaries	45% (27-60%)
Transportation	12% (8-15%)
Vaccine	12% (3-21%)
Miscellaneous	8% (5-43%)
Capital costs (facilities and equipment)	23% (14-30%)

Intensive campaigns can be relatively inexpensive per immunized child even through their total costs often are high. The 1984 Colombian Vaccination Crusade, for instance, which used three national vaccination days to administer DPT, polio, and measles vaccines, cost about $10 (US) per immunized child. The total cost was almost $5.9 million (72). El Salvador's three vaccination days in 1985 cost over $2 million. The cost per child receiving one or more vaccinations on a vaccination day was under $3 (165). Many intensive campaigns can keep expenditures down because employees of many different government agencies may be mobilized to work in the campaign. Others may volunteer their services.

Intensive vaccination campaigns spend a significant and increasing proportion of their budgets on communication. This undoubtedly contributes to their successes. The Colombian Vaccination Crusade, for instance, spent almost 60 percent of its budget for personnel, but much of the remainder—24 percent—went to publicity and health education. In contrast, most continuing immunization programs spend little on publicity and education.

Can the costs of immunization be reduced? Probably not without damaging the program. Cost-reduction strategies such as eliminating less used delivery sites or reducing the number of vaccination sessions per month could lower total costs, but they also make immunization less accessible to some children. Improving cost-effectiveness may be a more appropriate focus of attention. Costs per fully immunized child can be reduced substantially by lowering drop-out rates and by increasing the number of clients coming to each vaccination site. Both require better communication. In some places it may be possible to improve cost-effectiveness by reallocating resources—including personnel, cold chain equipment, and vaccine supplies—so that more children are reached (83, 367, 453).

Costs of Immunization vs. Treatment

Although immunization programs cost a substantial amount, they are inexpensive compared with the costs of treating children who develop vaccine-preventable diseases. For instance, with respect to measles and pertussis, in the US, treatment costs would be about $12 for every $1 spent on immunization, for a benefit:cost ratio of 12:1 (173, 175). In Yaoundé, Cameroon, the estimated benefit:cost ratio for a measles immunization program carried out between 1971 and 1976 was about 23:1 (224). In Indonesia the estimated benefit:cost ratio for DPT and BCG immunizations is about 3:1 (25). The assumptions made in such estimates vary—particularly assumptions about the cost of treating a serious case of a specific disease. Nonetheless, nearly all calculations lead to the same conclusion: immunization is an economical way to keep children healthy. If such estimates could include the many other costs of disease—from the value of parents' lost work to the incalculable costs of suffering and lives lost—the benefits of immunization programs would be even more obvious.

Funding

Total spending on immunization programs in developing countries has been about $300 million (US) annually in recent years and appears to be growing (160). Funding for immunization programs comes both from national governments and from donor agencies. In most programs, national health ministries supply about 80 percent of support, paying for personnel, facilities, and most operating expenses. Donor agencies, particularly UNICEF, often supply vaccines, cold chain equipment, vehicles, and training materials (110, 160). Other major donor agencies supporting immunization efforts include WHO, PAHO, US AID, Italy, the United Nations Development Program (UNDP), the World Bank, and Rotary International (537).

In the past few years the international community has increased support for immunization to help countries meet the 1990 goal of immunization for all children. In 1984 donors provided an estimated $58 million (US) for immunization programs in developing countries. UNICEF provided about half of this amount, most of it for vaccines, equipment, and training (160). In 1985 UNICEF began working to raise an additional $100 million to support measles immunization activities; the Italian government pledged $100 million over 18 months for immunization and other child survival activities; and Rotary International, a voluntary organization, pledged $120 million to provide polio vaccine (537). The US government provided about $100 million for immunization and other primary health measures. For fiscal year 1986 US AID doubled its support for immunization, from $20 million to $40 million. This includes funds to the Combatting Childhood Communicable Diseases (CCCD) program, run by ministries of health and the US Centers for Disease Control. CCCD has worked with EPI since 1978 to provide immunizations, as well as oral rehydration therapy (ORT) and malaria prophylaxis, in 12 African countries (640, 641).

To make immunizations available to all children by 1990, total expenditures may have to increase to over $1,000 million each year. This estimate assumes at least 80 percent actual coverage at a cost of $10 to $15 per fully immunized child (117).

SURVEILLANCE AND EVALUATION

The effective management of immunization programs requires constant surveillance of disease incidence and immunization coverage and regular evaluation of program performance at all levels. Managers need information about trends in disease incidence and immunization coverage. They need frequent internal reports on program operations and periodic comprehensive evaluations by outside experts. Such information is needed to set goals, assess progress, and solve problems as they arise.

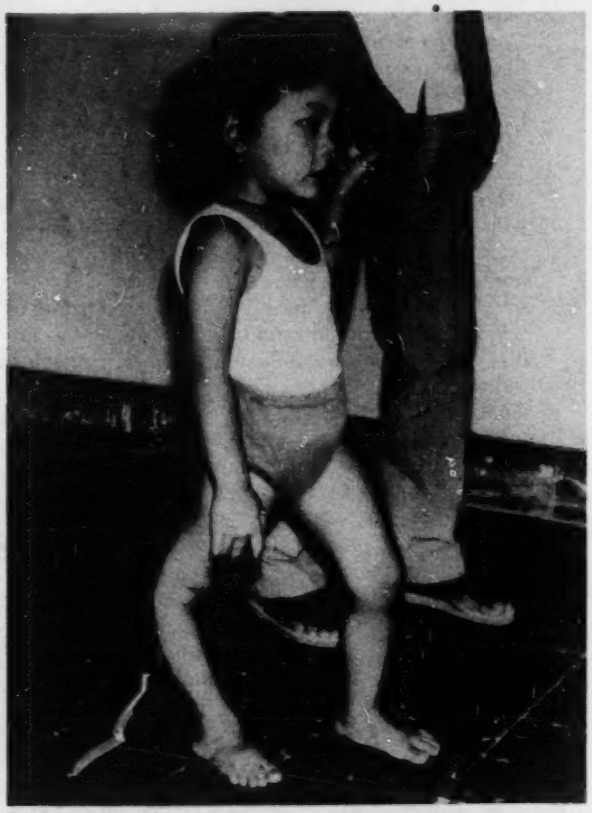
Information on disease incidence and immunization coverage trends also is important in maintaining support among government officials and the public. Furthermore,

accurate coverage and incidence data are necessary to coordinate immunization efforts globally, including identifying countries that may need further technical assistance or resources (160, 241, 518).

Disease Surveillance

Continuous disease surveillance is crucial to immunization programs. It is impossible to choose valid program strategies without knowing how many deaths or permanent disabilities each vaccine-preventable disease causes, where, at what time of the year, and among what age groups. Regular disease surveillance also is necessary to assess program progress toward reducing the incidence of targeted diseases (101). Disease surveillance data point to program successes in countries such as Brazil, Chile, Jordan, Sri Lanka, and Zaire (see Figure 1). Surveillance systems may give misleading information, however. Improving reporting may give the false impression that disease incidence is increasing.

Disease surveillance played a crucial role in the eradication of smallpox. In eastern Nigeria in 1968, because vaccine supplies were inadequate for a mass vaccination campaign, William Foege, the local advisor, developed what came to be known as the surveillance-containment strategy. Through intensive surveillance, smallpox cases were identified. Then all individuals in a defined area around each case were vaccinated. Through this strategy smallpox was eradicated from eastern Nigeria in six months, even though less than half of the population had been vaccinated. After this, the surveillance-containment strategy was used throughout the smallpox eradication effort. Not only was it highly effective, but also it reduced costs and personnel needs (130, 155, 156, 177). The surveillance-containment strategy is more difficult to apply to other diseases. It was particularly suited to smallpox because the disease was easily recognized and relatively slow to spread, and victims were not contagious before symptoms appeared. Nonetheless, case-finding remains an essential component of any immunization program.



Until recently the extent of polio in the developing world was unknown. Surveys have now revealed that lameness due to polio is common. These findings have spurred vaccination efforts. (WHO)

In most countries disease surveillance is inadequate. Surveillance guidelines often have not been developed, health workers have not been trained to recognize and report EPI diseases, and standard case-reporting forms—if they are available at all—often are not used. Furthermore, available information often is not summarized and disseminated to EPI workers at all levels so that they can assess needs and progress. Surveillance is a problem in developed countries, too. For instance, the discharge records of 11 US hospitals revealed that only 35 percent of notifiable diseases had been reported to health authorities (560).

WHO and PAHO have prepared surveillance guidelines that can be adapted by national programs (323). These guidelines recommend gathering information on disease cases from all possible sources—for example, health centers, private physicians, laboratories, special surveys, schools, and the market place. Data on deaths should be gathered not only from health care providers, but also from offices of vital statistics and through surveys. Data collected on cases should include name, age, date of onset, date, residence, vaccination status, source of report, and, if fatal, date and place of death (323). Reporting sources should be given clear reporting forms and guides for identifying diseases (323, 404). Reports of cases, especially polio, diphtheria, and tetanus, should be investigated, particularly to confirm diagnoses and to assess whether people in the area need to be vaccinated. Ultimately, disease surveillance data should be analyzed and used to guide program strategies (323).

Because routine surveillance procedures are not well-established in many countries, WHO recommends that in the short run countries develop "sentinel surveillance systems." A limited number of clinics or health posts providing immunizations are designated "sentinel posts." They regularly investigate and report disease cases. In Indonesia, for instance, a system of 43 sentinel posts has been established that covers a population of about two million (588). Estimates derived from sentinel systems may often be too low since the facilities reporting cases are likely to provide better than average immunization services. Nevertheless, sentinel surveillance can yield much useful information until nationwide systems are fully implemented. WHO also has recommended that countries focus on surveillance of polio, measles, and neonatal tetanus. These diseases were picked because (1) they, along with pertussis, cause the most morbidity and mortality of the six EPI diseases, (2) they can be easily diagnosed, and (3) their incidence will respond quickly to immunization efforts (518).

Another approach now being applied is to conduct household surveys to estimate disease incidence. These surveys usually involve visiting households in various regions and

interviewing parents about their children's illnesses over the past year or more. Such surveys have been particularly useful in demonstrating the high incidence of polio and neonatal tetanus in many developing countries (41, 211, 520, 576) (see p. L-161 and p. L-162). Before EPI, the full impact of these diseases was often unknown because parents did not bring sick children for treatment or cases were not reported to health authorities. Surveys also revealed that measles is a major cause of childhood mortality in many areas (see p. L-158).

Immunization Coverage

Regular assessment of immunization coverage also is needed. Ideally, all those who routinely immunize children—including health centers, local health depots, and private physicians—should submit weekly or monthly immunization reports. These reports should describe vaccines administered by type, dose (when more than one dose are required), child's age, and child's residence (323).

As with disease reporting, reporting of vaccines administered often is inadequate. Health workers may not be trained to collect data on vaccinations and/or they may be overloaded with tasks. Standardized reporting forms may not be available. A particular problem in many areas is that, when vaccinators report a DPT or polio vaccination, they do not record whether it is the first, second, or third dose—information crucial to determining what proportion of children is fully protected against these diseases.

Many countries have used surveys to estimate immunization coverage (462-465, 469, 471-474, 492, 564). To assist these efforts, EPI has developed a simple procedure called cluster sampling. Thirty clusters of seven children each (usually ages 12 to 23 months) are selected to be geographically representative. The children's immunization status is assessed from vaccination records and/or interviews with parents. From this information a fairly accurate coverage estimate can easily be calculated (163, 216, 455).

Other Special Surveys

Special surveys are useful to assess disease incidence and immunization coverage quickly. They can also assess vaccine quality and some local program operations.

Vaccine efficacy. Many programs now use a simple epidemiological approach to evaluate vaccine efficacy since laboratory tests often are not available (see p. L-177). Best implemented during or shortly after defined outbreaks of a disease (usually measles), this epidemiological approach involves interviewing parents to find out whether their children had the disease during the outbreak or previously and whether they had been previously vaccinated. Disease attack rates among vaccinated children and unvaccinated children are then calculated, and vaccine efficacy is estimated from these rates (40, 235, 268). Used in The Gambia during measles outbreaks, this approach revealed that vaccine was effective in 89 percent of children vaccinated at nine months or older (180).

Local program operations. Special assessments also are useful to evaluate local vaccination posts. From clinic personnel, parents, or, ideally, independent observers, managers can learn how many children are being served during each vaccination session, the age and sex of these children, how long they have to wait for service, and what proportion are being inappropriately turned away because of mild illnesses (551). Evaluations of vaccination posts also can indicate how well technical standards are being met. Observers of clinics in Alexandria, Egypt, for example, found typical problems: Vaccinators occasionally reused needles, administered incorrect doses of measles vaccine, and did not keep vials of vaccine on ice between uses (365).

Comprehensive Program Evaluations

To date, comprehensive reviews of immunization programs have been carried out in over 80 countries. Some programs have been evaluated two, three, or even four times since 1978. Using WHO EPI guidelines, these evaluations assess performance at all levels, from top management to cold chain operations to local health posts (586). Some also conduct surveys to assess immunization coverage. Evaluation teams generally consist of: EPI experts from WHO, UNICEF, and, in the Americas, PAHO; independent consultants; and government officials. Three examples of recent evaluation findings are shown in Table 3.

Available evaluations suggest the following common weaknesses:

(1) Surveillance and information systems need to be developed or improved. Data on disease incidence and immunization coverage are not routinely gathered, reported, summarized, and disseminated. Surveillance of neonatal tetanus is especially neglected.

(2) Supervision at all levels is often inadequate.

(3) Communication activities tend to be neglected, particularly in programs that rely on routine delivery strategies rather than intensive campaigns. Parents' lack of information is a major reason for low coverage and high drop-out rates in some areas.

(4) Tetanus toxoid immunization of pregnant or reproductive-age women often is ignored. Also, in some countries (particularly in Asia) measles immunization coverage lags behind BCG, DPT, and polio immunization coverage.

(5) Local level personnel have been observed failing to follow proper immunization procedures. For example, they may be inadequately sterilizing needles, refusing to vaccinate sick children, or following outdated immunization schedules. They also may fail to follow cold chain procedures, sometimes because proper equipment is not available or not working (20, 34, 48, 67, 73, 84, 128, 138, 238, 260, 289, 336, 343, 426, 427, 443, 447, 477, 522-535, 587, 621, 629, 651).

At the same time, these evaluations, combined with recent reports from intensive campaigns, show that some immunization programs have made remarkable progress despite the difficulty of the task and the short time that most have been operating. With sufficient funding and political support, programs such as those in Brazil, Burkina Faso, Colombia, Pakistan, Turkey, and Zaire have doubled or even tripled immunization coverage in just a few years. They have done so through flexible management, wide-reaching communication efforts, and often innovative delivery strategies. As more programs improve coverage and then meet the challenge of maintaining high coverage, many more children's lives will be saved.

Table 3. Comprehensive Evaluations of National Immunization Programs, Selected Findings: Egypt, Mexico, Zaire

Place, Date (Ref. No.)	Management/ Information Needs	Delivery Strategies/Local Operations	Cold Chain/ Vaccine Supply	Training	Supervision	Communication/ Community Participation	Data Collection/ Surveillance	Resources/ Personnel	Outcome: Coverage	Outcome: Incidence
Egypt 1984 (447) EPI started in 1978	– Poor coordination among various sectors – No full time national EPI manager – Local managers do not understand EPI objectives – National-level records badly organized	– Delivery not well-organized – Sick children not vaccinated – Open vials of vaccine often not destroyed after vaccination sessions – Staff seen using same needles for immunization & other injections	– Vaccine kept too long at central level – Poor inventory control – At local level: vaccines often improperly stored; temperature records often not kept	– Training & retraining needed at all levels	– Supervision lacking at all levels – Supervisory visits not structured; checklist seldom used – Over half of health centers visited did not keep supervisor's comments on file	+ Sufficient health education materials + More mothers brought children for other vaccinations after radio, TV promoted polio campaign – Health education materials not adequately distributed	– Health centers often do not report – EPI diseases underreported – Coverage overreported by 15–30% – Little monitoring or assessment of performance	+ Sufficient numbers of doctors & nurses + Vehicles available for vaccine transport – Many doctors in charge of EPI not interested in preventive medicine – Many health centers have too few syringes & needles	1984, from survey (age group not specified) BCG: 53% DPT: 57% Polio: 67% Measles: 41% From program statistics BCG: 74% DPT: 82% Polio: 81% Measles: 69%	No significant decreases in EPI diseases 1979–83; some increased
Mexico 1985 (238) EPI started in 1977	+ Program integrated with other preventive health services + Good planning for intensive phase of program – Poor information exchange between levels – No state level directors; run from various institutions	+ All vaccines provided regularly + Intensive (5-day) national vaccination efforts with measles vaccine, OPV + Routine delivery from fixed facilities & house-to-house – Remote areas sometimes not reached	+ National to state supply generally good – Poor temperature recording, especially weekends & holidays – Poor vaccine monitoring during transport – Occasional shortages of vaccines, especially BCG, OPV	+ In-service training for intensive phases of program – Training varies from state to state – Doctors, nurses often not trained – Poor training on communication	+ Some institutions have supervisory division + Supervision at many levels – Supervision only during intensive phases – No specific budget for supervision – No schedule for supervision at state level	+ Mass media promotion in all states – Little community involvement – Promotion only during intensive phase – Insufficient communication materials	+ Surveillance systems in each institution + Norms & procedures established – Weekly & monthly reports often not submitted – Poor dissemination of coverage, incidence data – Few studies of disease outbreaks	– Insufficient personnel at local level	1982–84, from program statistics (children under age 5) OPV: 80% DPT: 51% Measles: 46%	Since 1977 polio, diphtheria, pertussis have dropped. TB, tetanus stable. (No separate data on neonatal tetanus.) Measles up sharply in 1979–81.
Zaire 1982* (621) EPI started in 1977	+ A 1982–86 operating plan was developed + EPI is being integrated with the primary health care system	+ National vaccination schedule being followed everywhere + More children under age one being vaccinated – Still too much reliance on mobile teams for vaccinations	+ Cold chain adequate at all levels + Central store with 2 cold rooms being built – Need standardized innoculation techniques. Jet injectors still used even though unreliable.	+ Training plan developed in 1980 has been followed	+ Supervisor named for every district – Some supervisors may not be effective	+ In some villages health committees join immunization efforts	+ Polio & neonatal tetanus surveys carried out + To encourage reporting, vaccine supplies given only to clinics that submit monthly reports – Reporting still not standardized – Need case reporting by vaccination status	+ 39 new vehicles obtained – Need inventory of available resources	1981, from surveys in urban areas (children 12–24 months) BCG: 49–92% DPT: 20–92% Polio: 12–87% Measles: 40–94% (Coverage for DPT, polio very low in two areas. In the other six, coverage ranged from 55% to 90%.)	

+ Achievements – Problems

* The 1982 evaluation was done to assess progress since a 1980 evaluation. Major recommendations in 1980 included: build a central store; improve reporting procedures; integrate EPI with primary health care; reduce reliance on mobile teams; improve coordination among various agencies; establish training plan (582). A third evaluation was done in 1985. Results not available at press time.

Asterisk (*) designates an article that was of particular value in the preparation of this issue of Population Reports.

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Population Reports

Series L
Number 6
July-August 1986

ISSUES IN WORLD HEALTH

Population Information Program, The Johns Hopkins University, Hampton House, 624 North Broadway, Baltimore, Maryland 21205, USA

AIDS—A Public Health Crisis

Editors' Summary. AIDS—acquired immune deficiency syndrome—is a deadly, new, sexually transmitted disease now spreading rapidly in much of the world. At present there is no cure. For family planning and related health workers, AIDS creates special responsibilities. Why?

- People will bring their questions and concerns about AIDS to family planning and other maternal health workers because they are often the first line of health care. Family planning workers must be able to answer knowledgeably and advise clients how to avoid contracting or spreading the disease.
- Sexual intercourse—heterosexual or homosexual—is the major way that AIDS is transmitted. Family planning and related programs deal with people's reproductive health.
- Aside from sexual abstinence or a stable, mutually faithful relationship with another uninfected person, using condoms seems to be the best protection against sexually transmitted AIDS. Family planning programs can supply condoms and tell people how to use them.
- AIDS can be transmitted from mother to fetus during pregnancy or childbirth. In any area where AIDS has been reported, women who have had many sexual partners or women whose partners have had many partners face a high risk. These women should be told that they may be risking their future children's lives and perhaps their own by childbearing. Family planning workers need to carry out some of this counseling.
- Most AIDS cases have occurred among sexually active persons age 20 to 40. Family planning clients come from this same group.
- AIDS can be transmitted by blood transfusions (in countries where blood supplies are not tested) or by use of contaminated needles. Maternal and child health personnel need to avoid unnecessary transfusions and to maintain scrupulously the sterility of needles and syringes.

There has been much fear, misinformation, and rumor about AIDS. Everyone needs the facts. What should family planning workers and other health workers teach their clients? There are seven basic points:

1. AIDS is a fatal disease that cannot now be cured.
2. AIDS is **not** spread by casual contact.
3. AIDS is spread by sexual intercourse, by contaminated blood, and by contaminated hypodermic needles.
4. An infected woman can give AIDS to her child during pregnancy.
5. A stable, faithful relationship with another uninfected person is safest. In any case, reducing the number of sexual partners reduces the chances of getting AIDS.
6. For the sexually active, always using condoms is good protection against AIDS.
7. A person can look and feel healthy and still be able to spread the infection that causes AIDS.

Where and Who?

As of August 1986, 71 countries had reported almost 29,000 cases of AIDS. Cases have been reported on all continents, although in many areas the extent is unknown or greatly underreported. Currently, the largest numbers have been reported in the United States, Western Europe, Central Africa, Brazil, and Haiti. Worldwide as many as five to ten million peo-

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ple may be infected with the virus that causes AIDS, known as the human immunodeficiency virus (HIV). Most of these people have no symptoms now but can infect others. Many of these people are expected to develop AIDS eventually. In the US alone, more than 270,000 AIDS cases are expected by 1991.

In North America, Europe, and Brazil, most cases have involved homosexual men or users of intravenous drugs who have shared contaminated needles. In Africa and Haiti, many women are developing AIDS. In these areas sexual intercourse between men and women may be the main route of transmission. The number of children with AIDS is expected to grow, and in some areas AIDS may become a major threat to child survival.

What Is AIDS?

AIDS results from a viral infection that damages the immune system. The damaged immune system cannot protect against certain other infections and cancers, some of which then become the direct causes of death. These illnesses include an otherwise rare form of pneumonia, aggressive Kaposi's sarcoma (a type of cancer), brain infections, persistent diarrhea, and herpes infections. Because of the way that the virus infects cells, developing either a cure or a vaccine is extremely difficult. At best, both are years away.

What Must Be Done?

With no cure or vaccine in sight, the only real hope for controlling AIDS now is education that changes people's behavior. Family planning workers and other health workers must lead, but the mass media, community and national leaders, parents, and teachers also must help. The basic messages are simple, but they must be heard and heeded.

End of Editors' Summary.

EPIDEMIOLOGY

Acquired immune deficiency syndrome—AIDS—is a global epidemic. To date, only five years after the syndrome was first described, almost 29,000 cases have been reported in 71 countries around the world (91, 552, 554, 607, 638), and the World Health Organization (WHO) estimates that the actual number of cases may be as high as 100,000 (642). Although to date most cases have been reported in the US, AIDS appears to be increasing rapidly in some other countries, especially in Africa (286, 330, 344, 449). In addition to cases of AIDS, five to ten million people may be infected with human immunodeficiency virus (HIV), the virus that causes AIDS (642) (see p. L-201).

In the US, where AIDS was first reported in 1981 (195), formal nationwide surveillance began in 1982. Between June 1981 and June 1986, 21,517 cases were reported from all 50 US states (560), for a cumulative rate of 9 cases per 100,000 population. Two cities have the highest rates: New York, with 72 cases per 100,000 population, and San Francisco, with 68 per 100,000 (560).

In Europe AIDS is far less common. In the 27 countries reporting to the WHO European Collaborating Center on AIDS, 2,568 cases were identified between 1982 and June 1986, mostly in large cities (607). As of September 1985 the rates were highest—between 1.0 and 1.2 per 100,000 population—in Belgium, Denmark, and Switzerland (552). In Belgium over two-thirds of cases came from Africa for medical treatment (603).

Among developing areas AIDS appears to be most common in Brazil, Haiti, and Central Africa. Some 739 cases were reported in Brazil by June 1986 (83) and 377 in Haiti by December 1985 (601).

AIDS is rapidly becoming a major public health problem throughout sub-Saharan Africa. Nine African countries

". . . a minimum of 10,000 AIDS cases annually may be occurring in Africa."

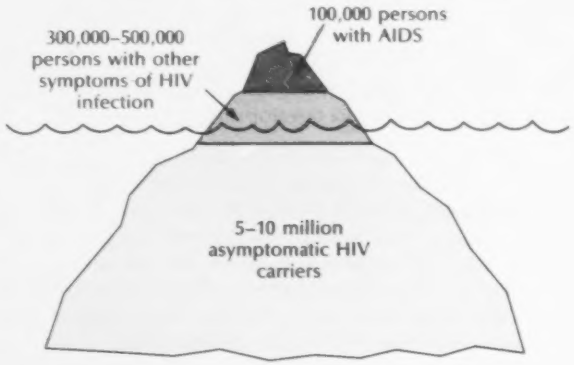
World Health Organization (611)

have officially reported a total of 378 cases (607), but WHO estimates that there have been at least 50,000 cases since 1980 (29, 422). The disease may have first appeared in the late 1970s in Zaire (89, 96, 344, 575), about the same time that it first appeared in the US (447) and Haiti (420). By 1984, based on hospital admissions and a survey of doctors, researchers estimated an annual incidence of 17 to 18 cases per 100,000 population in Kinshasa, Zaire (344, 436), and 80 per 100,000 in Kigali, Rwanda (573). Cases also have been reported in the neighboring countries of Zambia (58), Tanzania (66), Kenya (422), South Africa (503), and Uganda, where AIDS is known as "slim disease" because it causes extreme weight loss (75, 331, 498). To date, residents of 23 African countries have sought treatment in Europe for AIDS or related conditions (90, 118, 344).

The reported cases of AIDS are only the tip of the iceberg, for several reasons. First, many cases are not recognized. In the US, for example, 10 percent of AIDS cases may go unreported (233). Where diagnostic facilities are not available, a majority of cases may be missed. Second, cases of AIDS are reported only when they meet the criteria set up by the US Centers for Disease Control (US CDC) (see box, p. L-199). In fact, however, the immune deficiency characteristic of AIDS can lead to many other serious illnesses. These may not be reported or even diagnosed as related to AIDS. Third—and perhaps most important—many people are already infected with the virus that causes AIDS (see Figure 1 and p. L-201), but symptoms may not appear for several years after infection.

In Uganda a man with AIDS contemplates his grim and limited future. On his legs are the marks of Kaposi's sarcoma, a cancer of the blood vessels that is common in persons with AIDS. (Catharine Bond)

Figure 1. Estimated Numbers of Persons with AIDS, of Persons with Other Symptoms of HIV Infection, and of Asymptomatic HIV Carriers, World, Early 1986


100,000 persons with AIDS
300,000–500,000 persons with other symptoms of HIV infection
5–10 million asymptomatic HIV carriers

Source: Mahler (642)

The number of persons with AIDS is the tip of the iceberg. Three to five times as many people have other symptoms of infection with HIV, the virus that causes AIDS. Five to ten million carry the virus and can transmit it but have not developed symptoms.

AIDS Cases Increasing Rapidly

Cases of AIDS in the US and Europe are increasing rapidly. In the US twice as many cases were reported in the second half of 1985 as in the first half of 1984 (see Figure 2). Some 14,000 to 16,000 new cases are expected in 1986, almost as many as reported from 1981 to 1985 (137, 233, 568). The US Public Health Service estimates that by 1991 more than 270,000 cases will have been reported (568). In Europe the number of reported new cases increased from an average of 22 per week between March and June 1985 to 31 per week between October and December 1985 (603).

It is difficult to gauge just how rapidly AIDS is increasing in places where disease surveillance and diagnostic equipment are inadequate and where persons with AIDS may not seek or have access to medical care. Nonetheless, in Africa reports from hospitals suggest a rapid increase. In Uganda, for example, physicians in Mulago Hospital in Kampala did not see any cases in 1981 diagnosed as AIDS; in 1984 they saw one or two cases per month on average; in 1985, one or two cases per week; and in the first six months of 1986, one or two cases per day (330). In Zaire, at University Hospital in Kinshasa, cases of cryptococcal meningitis—an infection frequently found in Africans with AIDS—jumped from an average of less than one per year before 1978 to 44 cases over the years between 1978 and 1984—an average of six per year (575). At University Teaching Hospital in Lusaka, Zambia, cases of Kaposi's sarcoma—a cancer characteristic of AIDS—rose from about 10 per year before 1983 to 23 in 1983, 37 in 1984, and 25 in just the first four months of 1985 (59). A similar increase has been reported in Kinshasa (286). Unlike the common, slowly progressing, treatable Kaposi's sarcoma long known in Africa, these cases have taken an aggressive, fatal form similar to Kaposi's sarcoma found in persons with AIDS in the US and Europe (58, 59).

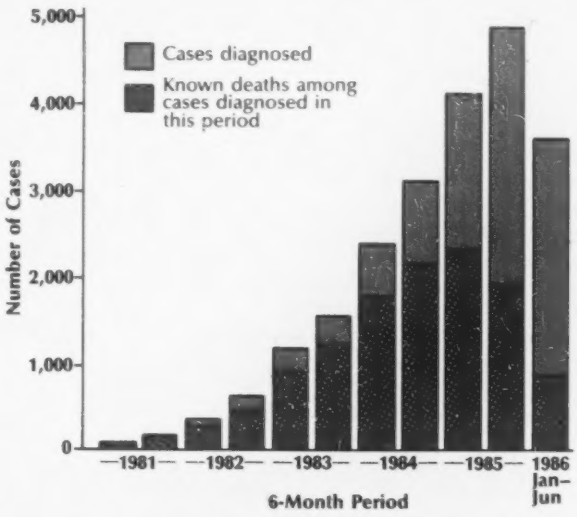
Characteristics of AIDS Cases

The epidemiology of AIDS varies markedly in different areas. In North America, Europe, and Latin America, AIDS has occurred primarily in homosexual and bisexual men (that is, men who have sexual relations with both men and women) and intravenous (IV) drug users. In contrast, in Africa and Haiti, women appear to be about as likely as men to be infected and develop AIDS.

In developed countries adults with AIDS have been grouped into five categories defined by the US CDC for reporting and surveillance purposes (see Figure 3). Because some people in these groups are likely to engage in behavior that may expose them to the virus or because they have received donated blood or blood products (see pp. L-203–205), these are identified as high-risk groups. In general, in Europe and the US the distribution among these categories has remained fairly constant since 1981. In Europe, however, the percentage of cases associated with IV drug use has increased sharply since 1984 (552). Over 90 percent of all US and European cases are men. Most are between the ages of 20 to 49 (see Figure 4). Children under age 13 make up less than 3 percent of cases (559, 603).

In Africa and Haiti very few people with AIDS report homosexual or bisexual activity. In Africa 35 to 57 percent of reported cases are women (186, 344, 436, 498, 573). In Haiti the percentage of cases who are women has increased steadily from 14 percent in 1980-82 to 36 percent in 1985 (275). This and other evidence suggests that heterosexual intercourse is a major means of transmission (see p. L-202). At the same time, intramuscular injections are common in these countries and may be an important mode of transmission (see p. L-204). All these findings are important to family planning and maternal and child health programs. Because the virus that causes AIDS can be transmitted during pregnancy and childbirth (see p. L-205), many infants may develop AIDS. Indeed, up to 14 percent of pregnant women studied in Kampala, Uganda, are infected with the virus (330).

Figure 2. AIDS Cases Reported to the US Centers for Disease Control, by Period of Diagnosis, and Known Deaths Among Those Cases, United States, 1981–1986



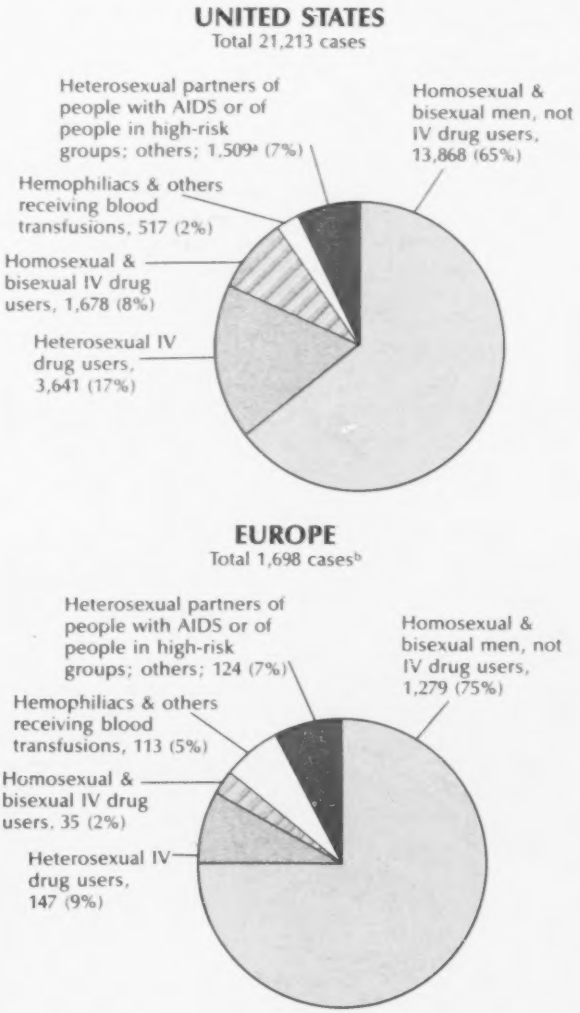
Source: US Centers for Disease Control (559, 560)

The number of reported cases of AIDS has increased rapidly in the US. Most cases reported before 1985 have died. A lag in reporting probably explains the apparent decline in January-June 1986.

Mortality

At present AIDS is a fatal disease. No effective treatment is currently available. Although the interval between diagnosis and death varies widely, in the US about 50 percent of patients die within 18 months of diagnosis; about 80 percent, within 36 months (36, 207). Some 55 percent of adults and about 61 percent of children diagnosed with AIDS since 1981 have died (560) (see Figure 2). Rates are similar in Europe (552). In Africa and Haiti survival time after diagnosis is shorter (290, 419, 420, 436, 526), probably because of later diagnosis and lack of access to care.

Figure 3. Classification of Reported Cases of AIDS in Adults, United States and Europe, as of 1985–1986


UNITED STATES
Total 21,213 cases
Heterosexual partners of people with AIDS or of people in high-risk groups; others; 1,509[a] (7%)
Homosexual & bisexual men, not IV drug users, 13,868 (65%)
Hemophiliacs & others receiving blood transfusions, 517 (2%)
Homosexual & bisexual IV drug users, 1,678 (8%)
Heterosexual IV drug users, 3,641 (17%)
EUROPE
Total 1,698 cases[b]
Heterosexual partners of people with AIDS or of people in high-risk groups; others; 124 (7%)
Homosexual & bisexual men, not IV drug users, 1,279 (75%)
Hemophiliacs & others receiving blood transfusions, 113 (5%)
Homosexual & bisexual IV drug users, 35 (2%)
Heterosexual IV drug users, 147 (9%)

Note: US data as of June 1986; source: US CDC (559). European data as of December 31, 1985; source: WHO (603).

[a] Includes 472 Africans and Haitians not in other risk groups

[b] Includes only those born in Europe for whom information is available. Excludes 279 cases reported among persons born elsewhere and 29 cases with no information.

Cases of AIDS have been categorized into five groups by the US CDC. No categorization is available for Africa, but most cases probably became infected through heterosexual intercourse.

In the US, AIDS has become a major cause of death in young men. In New York and San Francisco AIDS is one of the five leading causes of death among men between the ages of 24 and 54. In New York AIDS accounts for almost 20 percent of deaths among men age 35 to 39 (303). US CDC estimates that, nationwide, AIDS has caused almost as much premature mortality in men age 25 to 44 as all forms of cancer (137, 266).

INFECTION

Infection with human immunodeficiency virus (HIV), a newly discovered virus, takes many forms. It ranges from a complete absence of symptoms, to mild illness, to debilitating neurological disorders and fatal disease. AIDS is the end stage of this infection. Many more people are infected with the virus than show any symptoms. This is a cause for major public health concern. How many of these asymptomatic people will develop symptoms and how many will develop AIDS are still uncertain.

In 1986 US CDC classified the clinical features of HIV infection into four broad categories:

I. Initial infection with the virus and development of antibodies,
II. Asymptomatic carrier state,
III. Persistent generalized lymphadenopathy,
IV. Other HIV-related disease including AIDS (540).

Initial Infection and the Asymptomatic Carrier State

Infection begins when HIV enters the bloodstream and stimulates an immune response and the development of antibodies. The presence of these antibodies (seropositivity) usually indicates that infection has occurred. Most infected people have no symptoms and do not know that they are carrying the virus (see Figure 1). Nevertheless, presumably all who are infected, with or without symptoms, can transmit the virus to others.

The majority of people who become infected develop antibodies without any immediate symptoms (134, 376). A sizable minority experience a short-term illness similar to mononucleosis or, rarely, acute neurological symptoms, such as seizures and temporary motor impairment. This occurs about two to five weeks after initial infection (20, 104, 129, 328, 408, 433, 523, 534). Antibodies to HIV can usually be detected two to eight weeks after initial infection (305, 576), although in a small minority six months or more may elapse (212, 476, 571).

In the second category of HIV infection, the asymptomatic carrier state, infected people have antibodies but no overt signs of disease. Laboratory tests may show a reduced

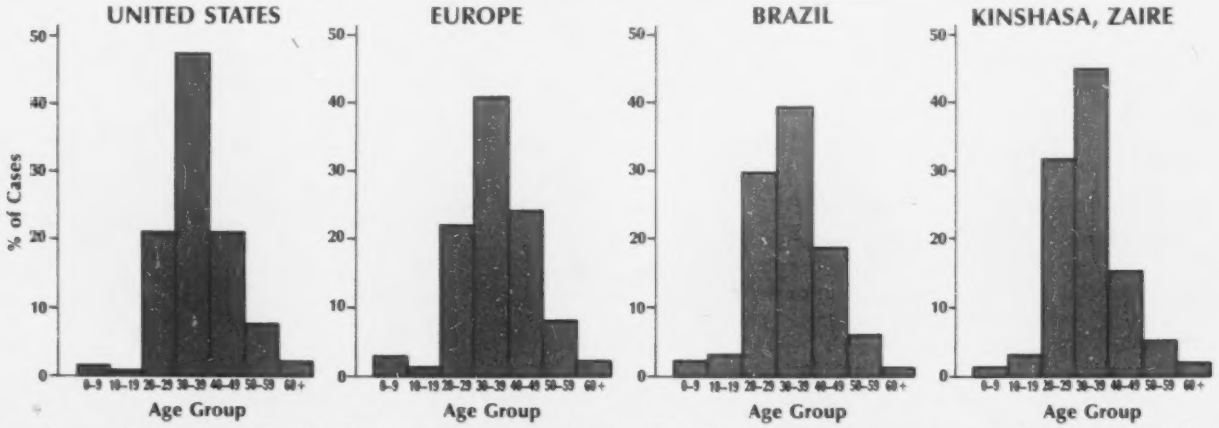
10 Ways Health Workers Can Help Stop AIDS

What can health workers and institutions do now to reduce the spread of AIDS? When feasible, the following steps can be taken:

1. Learn about AIDS.
2. Inform the public about AIDS.
3. Encourage condom use.
4. Encourage clients to develop a stable, mutually faithful sexual relationship or at least to reduce the number of sexual partners.
5. Counsel all clients who are or may soon become sexually active about AIDS.
6. Screen donated blood and educate donors.
7. Give transfusions *only* when clearly necessary.
8. Use *only* sterile needles, syringes, and other instruments.
9. Warn clients to avoid any injections with needles that may not be sterile. Encourage users of intravenous drugs to use only sterile needles and syringes, to reduce drug use, and to use condoms.
10. Counsel people who may be infected with the AIDS virus and tell them how to avoid infecting others.

Detailed discussion of these actions can be found on pp. L-212–217 of this issue of **Population Reports**. Precautions that health workers can take to protect themselves are listed on pp. L-214–215.

Figure 4. Age Distribution of Reported AIDS Cases in Four Areas



Source: US Centers for Disease Control (558); based on 22,815 cases.

Source: World Health Organization (603); based on 2,006 cases in 23 countries.

Source: Brazil State Health Departments (83); based on 628 cases.

Source: Mann et al. (344); based on 759 cases.

In four quite different areas the age distribution of reported AIDS cases is very similar. Most cases occur in people age 20 to 49. Since these are the ages when people are most active sexually, these patterns are further evidence for sexual transmission.

number of T-helper lymphocytes, also called T-4 lymphocytes, specialized white blood cells that help fight infection (see box, this page).

It is not clear how long infected people may be asymptomatic because it is often impossible to determine when people were first infected. Some US men, however, are known to have been infected for at least five years without developing symptoms (175, 264, 376). In only two reported studies, both involving small numbers of US men, researchers have been able to estimate the actual time of infection. About two-thirds of the men had been asymptomatic for 1½ to 5 years, and one-third had developed either some symptoms or AIDS during that period (263, 425, 553).

Persistent Generalized Lymphadenopathy and Other Non-Life-Threatening Conditions

A more severe form of HIV infection occurs when people with antibodies develop symptoms. These symptoms have

The Virus and the Immune System

Human immunodeficiency virus (HIV), the virus that causes AIDS, belongs to a class of viruses called retroviruses. Other retroviruses are thought to cause a rare type of cancer in humans and cancers and a variety of immune diseases in animals (87, 199, 218, 390, 596).

Like all viruses, retroviruses reproduce only in living cells of a host species (218, 567). What sets retroviruses apart is their unique method of reproducing, involving an enzyme called reverse transcriptase. Reverse transcriptase allows the virus to copy its genetic information into a form that can be integrated into the host cell's own genetic code (218). Each time a host cell divides, viral copies are produced along with more host cells, each containing the viral code (199).

Once the virus enters a host cell, permanent infection is established. A retrovirus may not cause any ill effects for years, however (170, 218). Then, under certain conditions—which still are not understood—the genetic material in the host cell may be activated to produce new virus. This new virus can be released from the host cell (627) and can infect other cells. With HIV, which infects primarily certain cells in the immune system, stimulation of an immune response may be one of the conditions that activates the production of new virus. Current research into treatment of HIV infection is focusing on drugs that block the function of reverse transcriptase and so prevent the virus from infecting new cells (see box, p. L-206).

There are many different strains of HIV. Some vary only slightly from one another; others vary extensively (597). Most strains differ in the outer viral coat, or envelope—the first part of the virus recognized by the immune system (63, 597). HIV appears to have the ability to change the genetic structure of these external proteins rapidly and thereby escape recognition by the immune system. This may make developing a vaccine difficult (see box, p. L-208).

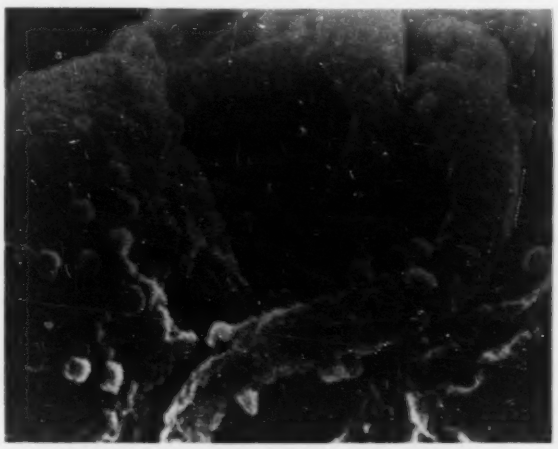
Effect on the Immune System

The human immune system is a complex and interlocking network of cells and organs. A breakdown in any component of this network can disrupt the entire system. The immune system disorders associated with AIDS are thought to stem primarily from a single defect—the gradual depletion of a specialized group of white blood cells (lymphocytes) called T-helper or T-4 cells. These cells play a key role in regulating the immune response: they set the immune response in motion. They send out chemical signals that stimulate the production of antibodies and trigger the maturation of several types of cells of the immune system (280, 314, 566).

HIV selectively infects T-helper cells as well as several other types of cells in the immune system—B-cells and macrophages—and nerve cells (203, 596). When the virus reproduces, the infected T-helper cell is destroyed. Consequently, people with AIDS tend to have a low overall lymphocyte count. Eventually so many T-helper cells are lost that the remaining cells cannot perform their regulatory function, and immune deficiency results (264, 398).

HIV infection not only depletes T-helper cells but also may prevent surviving cells from functioning properly. They are unable to recognize foreign substances (antigens) and initiate immune responses to these antigens that will eliminate them from the body (306, 593). The loss of immunity is selective, however, and affects primarily the parts of the immune system involved in defense against parasitic, viral, and fungal organisms. Thus people with AIDS develop certain unusual infections but can resist other, more common illnesses.

Several common diseases—tuberculosis, malaria, several types of influenza, and measles—as well as malnutrition and stress temporarily suppress the immune response. Once the original infection resolves, the immune system returns to normal (314, 566). With HIV infection, however, the immune deficiency is permanent.



HIV, the AIDS virus, infects a T-helper cell, an essential part of the immune system. Viral particles are released by budding through the cell membrane. By infecting T-cells, HIV damages the immune system. (American Red Cross)

been variously termed persistent generalized lymphadenopathy, lymphadenopathy syndrome, AIDS prodrome, AIDS-related conditions, lesser AIDS, and AIDS-related complex (ARC). Persistent generalized lymphadenopathy, the third US CDC category, is defined as swollen lymph nodes in two separate sites other than the groin for more than three months (446). Lymphadenopathy is one of the most common signs of HIV infection, but many persons with lymphadenopathy may not be aware of it.

Persistent generalized lymphadenopathy may occur alone or in combination with night sweats, fever, diarrhea, weight loss, fatigue, and uncommon infections such as oral candidiasis (thrush) and herpes zoster infection (shingles). These symptoms may occur intermittently or persistently, and they vary in severity. They are usually not life-threatening, but diarrhea and weight loss sometimes do cause death (33, 446).

For some, persistent generalized lymphadenopathy, alone or with other symptoms, is an intermediate stage between initial infection and AIDS. For others, these symptoms appear to be a chronic manifestation of HIV infection (183, 376) (see Figure 5). After about two years up to 20 percent of people with these symptoms have developed AIDS (33, 34, 183, 214, 369, 383, 394). In the longest follow-up to date of people with persistent generalized lymphadenopathy—4½ years on average—12 of 42 men (29 percent) developed AIDS (370).

AIDS and Other Serious Conditions

AIDS is the end stage of HIV infection. As defined by US CDC, AIDS is characterized by life-threatening opportunistic infections (infections that occur only in people with immune deficiency) and/or cancers that occur in people with otherwise unexplained defects in immunity (see box, this page). These infections occur because people with AIDS have lost most of their natural defenses against certain infections and are unable to fight them off (see box, p. L-198).

US CDC Case Definition of AIDS

AIDS is a syndrome—a complex of diseases and symptoms—resulting from unexplained immune deficiency. In 1982 the US CDC formally established a specific definition of AIDS for surveillance and reporting purposes. AIDS was defined as:

(1) the presence of a reliably diagnosed disease, such as *Pneumocystis carinii* pneumonia or Kaposi's sarcoma, that signals an underlying deficiency in the immune system and

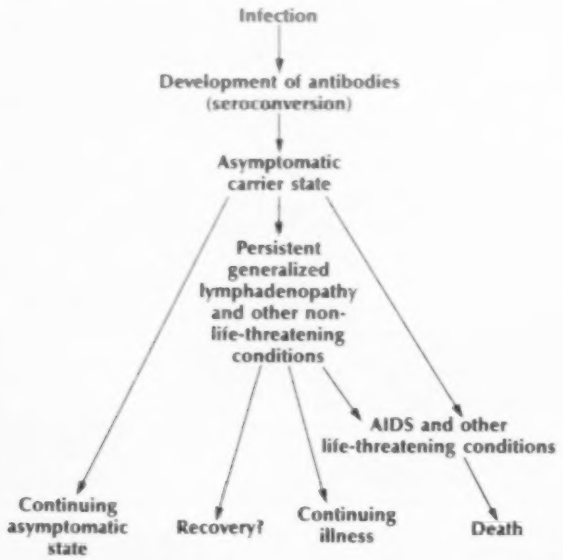
(2) the immune deficiency is not due to drugs, certain types of cancer, congenital disease, or other known causes (561).

Between 1982 and 1985, HIV was discovered, tests to detect HIV antibodies were developed, and other illnesses associated with the virus were recognized. Thus in 1985 US CDC expanded its case definition to include:

(3) certain other opportunistic infections and cancers of lymph tissue in people found to harbor HIV or test positive for HIV antibodies (548).

Since the US CDC definition depends partly on laboratory analyses, WHO is developing a provisional clinical definition for use where laboratory tests are not available (605).

Figure 5. Natural History of Infection with HIV



Source: adapted from Bartlett (56)

The spectrum of opportunistic infections and other symptoms in people with AIDS varies in different regions, usually reflecting the infections prevalent in these regions. Some of the differences, however, may be due to lack of diagnostic facilities in some countries to detect certain diseases (526, 573). In Haiti and Africa the most common opportunistic infections are tuberculosis, cryptococcal meningitis, herpes simplex infection, oral or esophageal candidiasis, cryptosporidiosis, central nervous system toxoplasmosis, and skin rashes. Chronic diarrhea and weight loss are very common (121, 124, 181, 344, 403, 419, 436, 450, 498, 573). In the US, in contrast, 63 per cent of people with AIDS are diagnosed with *Pneumocystis carinii* pneumonia (see box, p. L-200). Cryptococcal infections, cryptosporidiosis, and toxoplasmosis have been reported in less than 5 percent (554).

Kaposi's sarcoma is the most common malignancy in people with AIDS. It has been diagnosed, mostly among homosexual men, in 33 percent of AIDS cases in Europe (552) and 24 percent in the US (237). In Africans Kaposi's sarcoma is reported in 2 to 20 percent of cases (121, 124, 243, 349, 357, 436, 498, 573), and in Haitians, in 5 to 12 percent (181, 224). Other types of cancer, especially Burkitt's lymphoma and non-Hodgkins lymphoma of the central nervous system, also occur in people with AIDS (68, 69, 260, 319, 327, 332, 428, 474, 487, 518, 630, 631).

Neurological disorders occur in people with HIV infection. These disorders can be severe, including progressive memory loss, dementia, psychiatric symptoms, encephalitis, and meningitis. The virus can infect cells in the brain as well as certain white blood cells and has been isolated from the brain and cerebrospinal fluid of people with AIDS (53, 251, 324, 456, 502). In US studies 31 to 66 percent of people with AIDS have neurological symptoms (161,

Common AIDS-Related Opportunistic Infections

Most AIDS patients develop multiple opportunistic infections or cancers and die either because (1) the infection cannot be treated effectively or (2) their weakened immune system impairs resistance to infection and response to therapy (643). The following are the most common opportunistic infections:

- **Cryptococcal meningitis**, caused by a yeast-like fungus, usually starts with low-grade fever and mild headache. Nausea, vomiting, and blurred vision may follow. Patients become progressively lethargic. If untreated, the disease is fatal. Even with treatment up to one-quarter of patients die of progressive cryptococcal disease (634, 643).
- **Central nervous system toxoplasmosis**, caused by a protozoan, leads to encephalitis (inflammation of the brain). Among the most common early signs are neurologic defects such as seizures and cognitive disorders. Fever, headache, lethargy, and confusion also are common. If untreated, this illness is almost always fatal (62, 181, 643).
- ***Pneumocystis carinii* pneumonia**, caused by a protozoan, occurs almost exclusively in persons with immune deficiency. Symptoms include fever, chills, cough, and shortness of breath. Life-threatening respiratory failure may occur (62, 643).
- **Cryptosporidiosis**, another protozoan disease, causes debilitating diarrhea that may last for weeks and even months and is very difficult to treat. Other symptoms include cramps, fever, nausea, and vomiting. Diarrhea can be severe enough to cause dehydration and death unless nutritional supplements are given (62, 643).
- **Kaposi's sarcoma**, a cancer of the blood vessels, is the most common cancer in AIDS patients, in whom it is more aggressive than in those who do not have AIDS. Kaposi's sarcoma appears as dark blue or purple raised areas on the skin, often first appearing on the trunk or upper extremities but also on the ears and nose. These skin nodules are not itchy or painful. Although people occasionally survive several years, the disease commonly spreads to the internal organs and may eventually cause death. Persons with Kaposi's sarcoma usually die from opportunistic infections, however (58, 59).
- **Tuberculosis** (TB), caused by bacteria, can affect many organs. Disseminated TB is common in AIDS patients. Also, they may develop extremely aggressive tubercular lesions in sites not usually affected by the disease. AIDS patients with tuberculosis usually respond well to treatment (62, 634, 645).
- **Herpes simplex viruses** cause skin lesions in or around the mouth or in the genital and rectal areas, depending on the type of virus. In people without immune deficiency, these lesions are generally mild and temporary, although recurrent. In AIDS cases lesions are more severe and recur more often (62, 643).
- **Candidiasis** in the alimentary tract, or thrush, is caused by a yeast. Candidiasis is common and usually benign in infants but is very rare in adults. Two types often occur in AIDS cases. Oral candidiasis, the more common, causes white, usually painless lesions in the mouth. The other type, esophageal candidiasis, may cause pain or difficulty in swallowing. Candidiasis generally responds to treatment, but relapse is common; many patients must be treated for the rest of their lives (634, 643).

HIV Infection and AIDS in Children

AIDS is less common in children than in adults, but the number of cases in children is expected to rise rapidly. AIDS in children was first diagnosed in 1983 in the US (45, 406, 468). By July 1986, 321 US children under age 13 with AIDS had been reported. Over 60 percent of these children had died (554). Disease resulted from infection during pregnancy or childbirth in about three-fourths of these children. Most of the others acquired HIV infection through transfusions. The number of actual cases of AIDS among children in developing countries is unknown. Most countries do not have national reporting yet. Also, diagnosing AIDS in children is difficult because the major symptoms—diarrhea and failure to thrive—are very common and nonspecific.

Little is known about the prevalence of HIV infection among children. In the US, researchers estimate that as many as 1,000 children are infected with the virus but have not developed AIDS (467). No studies are available, however. In Zaire two studies from Mama Yemo Hospital found that 10 to 12 percent of hospitalized children were infected with HIV in 1984 and 1985 compared with 1 to 2 percent of two healthy control groups (142).

HIV infection progresses differently in children than in adults. Certain symptoms and illnesses are more common—chronic swelling of the parotid gland, recurrent bacterial infections, central nervous system abnormalities, and lymphoid interstitial pneumonia (44, 388, 493). Central nervous system abnormalities have been reported in 50 to 80 percent of infected children (162, 414, 467, 535). In contrast, Kaposi's sarcoma, which is found in over 20 percent of US adults with AIDS, is uncommon in children (44, 388, 493).

Researchers in New York have reported a distinct syndrome among 20 children infected with HIV in utero. The syndrome involves growth retardation and multiple facial and cranial abnormalities—an abnormally small head, a prominent box-like forehead, and a flattened nasal bridge (352).

There are no answers yet to some important questions concerning HIV infection in children: (1) What is the likelihood that an infected woman will transmit the virus to her child? (2) What factors increase the risks of transmission from mother to child? (3) Is the virus readily transmitted in breast-milk? (4) Can the prognosis for infected children be improved? (5) Are there risks from immunizing infected children? Answers to these questions are urgently needed to help stem the rising tide of AIDS in the very young.

325, 397, 511) and, in one small African study, 52 percent (243). In fact, neurological symptoms may be the first sign of AIDS in about 10 percent of cases (275, 326).

Progression of Disease

Overall, how many people infected with HIV will develop AIDS or other symptoms? At this point, it is difficult to say. AIDS is so new that long-term prospective studies are just beginning to yield results. It has been variously estimated that *each year* 8 to 10 percent of asymptomatic infected persons develop some symptoms (440) and that 2 to 10 percent develop AIDS (72). One of the longest studies to date followed 57 homosexual men in San Francisco, who were known to be infected with HIV, for a median of five years. Among the 57 men, 10, or 18 percent, have developed AIDS, and 27, or 45 percent, have developed other symptoms (470).

The proportion of infected individuals who develop symptoms or AIDS seems to vary in different groups. For example, after at least three years' follow-up, 34 percent of a group of infected homosexual men in New York had developed AIDS compared with 12 percent of a group of infected hemophiliacs in Pennsylvania. Exposure to as-yet-unidentified risk factors, such as greater dose of the virus, concurrent infections, or drug use, might explain this difference. It is not known exactly when the participants were infected, however. Therefore the difference may have occurred because the New York group had been infected longer than the Pennsylvania group (208). The reported incubation period—that is, the time between infection and first symptoms or diagnosis—also varies widely, ranging from 1.5 to 7 years (136, 165, 208, 212, 222, 263, 265, 368, 377, 398, 425, 448). A mathematical model based on transfusion cases suggests that the incubation period may range from four months to 10 years with a mean of 4.5 years (641).

Why do some people with HIV infection develop symptoms or AIDS while others do not? Very little is known about the factors that influence progression of HIV-related infection. One hypothesis is that repeated infections and possibly exposure to antigens (infectious agents or possibly other foreign substances such as semen or transfused blood) may activate the replication of HIV, leading to various symptoms (see box, p. L-198). Several studies have found that persistent generalized lymphadenopathy or AIDS often occurs in people with current and/or past infection with various other viruses—cytomegalovirus, hepatitis B virus, or Epstein-Barr virus (141, 149, 156, 173, 247, 309, 312, 450, 512) or with a recent history of sexually transmitted diseases and/or sexual intercourse with many partners without the use of condoms (66, 122, 262, 484, 573, 583). Not all studies report these findings, however (183, 370). Another hypothesis is that certain conditions—malaria, certain other parasitic diseases, and malnutrition—may themselves compromise immune function, increasing the chances of immunosuppression with HIV (450).

Use of certain drugs also may lead to HIV-related illness, but evidence is very preliminary. Several US studies have found that homosexual men with persistent generalized lymphadenopathy or AIDS, especially involving Kaposi's sarcoma, were more likely to have used volatile nitrites (drugs inhaled to enhance sexual pleasure) than healthy men (238, 353, 370). Others find no such relationship, however (141, 183, 206).

"AIDS, the syndrome, is only the tip of the iceberg: for every AIDS case there are three to five cases of the less severe AIDS-related complex and anything between 50 and 100 silent carriers, giving a cumulative total of 5 to 10 million infected persons, capable of transmitting the virus."

Halfdan Mahler, Director-General, WHO (642)

It has been suspected that pregnancy triggers symptoms in infected women, but the evidence is conflicting. In a US study 6 of 11 asymptomatic women developed AIDS or other symptoms during pregnancy. All of the 11 women were known to have been infected for at least a year because all had previously given birth to a child infected with HIV (495). Another study in the US, however, reported no progression of illness during pregnancy (497). A woman with HIV infection needs to use condoms because, if she becomes pregnant, she can pass the virus to the fetus during pregnancy and possibly endanger her own life as well. In addition, using condoms will help to protect her sexual partner.

Prevalence of Infection

WHO estimates that five to ten million people worldwide are infected with the virus (642). Making estimates is difficult because they must be based on small studies of selected populations. In the US possibly one to two million people may be infected (170, 568). Rates of infection are highest among hemophiliacs, homosexual men, and IV drug users (see Table 1, pp. L-219–220). In Africa also, possibly one to two million people are infected, according to a WHO estimate (339, 422). High rates are reported in prostitutes and clients of STD clinics, but HIV infection is not confined to any specific group. In studies using two different blood tests to achieve greatest accuracy, from 2 to 14 percent of pregnant women and new mothers in Kenya, Malawi, Uganda, Zaire, and Zambia were infected, as were

What to Call the Virus?

In 1983 and 1984 groups of researchers working independently in France and the US discovered a retrovirus believed to cause AIDS. The French researchers named the virus lymphadenopathy-associated virus (LAV) (54). Different US researchers named it human T-cell lymphotropic virus-III (HTLV-III) (200, 441) and AIDS-associated retrovirus (ARV) (321). To give credit to both French and US scientists, many have used the terms HTLV-III/LAV or LAV/HTLV-III.

In May 1986 the International Committee on the Taxonomy of Viruses recommended a new name, human immunodeficiency virus (HIV). The committee chose this name because it identifies the group affected—humans—and it describes the major effect of the virus—immunodeficiency (123). While some have objected (365), the name HIV is being increasingly adopted. For simplicity and brevity, the name HIV is used in this issue of **Population Reports**.

6 to 11 percent of male and female blood donors in Uganda and Zaire (see Table 1). In Tanzania, Uganda, and Zambia, infection has been found to be equally common in rural and urban areas (245, 331, 339, 453). In Latin America 5 to 12 percent of small groups of homosexual men studied in Panama and Peru were infected (462, 625).

Rates of infection have increased rapidly among some groups in the US, Europe, and Africa (see Table 1). In Nairobi, Kenya, for example, only 4 percent of 58 prostitutes tested positive in 1981 compared with 69 percent of 535 prostitutes tested in 1985 (435, 510). In contrast, a study in Baltimore of homosexual men who initially showed no evidence of HIV infection found, in three successive 6-month periods beginning in April 1984, that 4 percent, 2 percent, and one percent developed antibodies indicating HIV infection. All study participants had been advised about safe sexual practices. The results suggest that educational efforts to change behavior in high-risk groups can have some effect (440).

TRANSMISSION

Most reported cases of AIDS have been sexually transmitted. Only the most intimate contact, usually involving the transfer of semen or blood from one person to another, can spread the virus. Thus AIDS is not a highly contagious disease. Unlike the virus that causes measles, for example, the virus that causes AIDS is not transmitted through the air. There also is no evidence that it is transmitted through casual contact, by insects, or by food or water (339). The virus is transmitted:

1. by sexual intercourse,
2. by transfusions of contaminated blood or blood products,
3. by sharing or reusing contaminated needles, and
4. during pregnancy, childbirth, and possibly breastfeeding, from woman to child.

Since the routes of transmission are limited, a few protective practices—using condoms, limiting the number of sexual partners, sterilizing needles and syringes, and avoiding pregnancy in infected women—can substantially reduce the transmission of the virus. Because the virus may be transmitted by infected people who have no symptoms, the best way to minimize the risk of infection through sexual contact is to abstain from sexual relations with people who are at high risk or always to use condoms unless partners are known to be free of infection.

Presence of HIV in Body Fluids

Transmission of HIV always involves exposure to body fluids from an infected person. The dose or amount of virus, the route of exposure, and the duration of exposure all may influence the chances of becoming infected. It is not known, however, how much virus over what period of time is needed to cause infection or what other factors affect the chances of infection.

HIV has been isolated from various body fluids. The greatest concentrations have been found in blood (54, 200, 221, 322), semen (252, 322, 626), and cerebrospinal fluid (251, 324). Lower concentrations have been detected infrequently in tears (197), saliva (221, 250, 316), breast milk (528), colostrum (577), urine (322), and cervical and vaginal secretions (577, 595). HIV also has been isolated in brain tissue (251), lymph nodes, bone marrow cells (376), and skin (299). To date only blood and semen have been conclusively shown to transmit the virus.

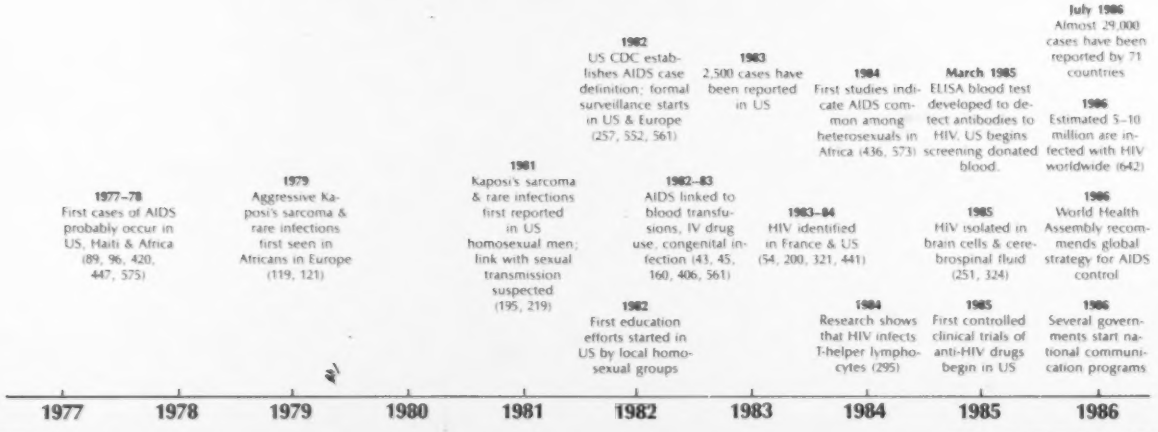
Scientists think that HIV infection is chronic and that infected people will always be carriers. In other words, they are capable of transmitting the virus even though they may have no symptoms of infection.

Sexual Transmission

HIV infection can be transmitted during sexual intercourse between men and between men and women. Some 65 to 75 percent of AIDS cases in the US and Europe have occurred in homosexual or bisexual men (see Figure 3). While the number of cases attributable to heterosexual transmission is smaller (at least in the US and Europe), the evidence for heterosexual transmission is convincing. It consists of cases of HIV infection and AIDS in sexual partners of infected persons (98, 182, 223, 235, 301, 348, 374, 419, 438, 454, 455); in women artificially inseminated from an infected donor (522); and in female prostitutes (302, 347, 419, 435, 436, 510, 572).

Certain sexual patterns and practices increase the risk of infection more than others. Relations with multiple sexual partners increase the chances of encountering someone

AIDS—A BRIEF HISTORY


1977–78
First cases of AIDS probably occur in US, Haiti & Africa (89, 96, 420, 447, 575)
1979
Aggressive Kaposi's sarcoma & rare infections first seen in Africans in Europe (119, 121)
1981
Kaposi's sarcoma & rare infections first reported in US homosexual men; link with sexual transmission suspected (195, 219)
1982
US CDC establishes AIDS case definition; formal surveillance starts in US & Europe (257, 552, 561)
1982–83
AIDS linked to blood transfusions, IV drug use, congenital infection (43, 45, 160, 406, 561)
1982
First education efforts started in US by local homosexual groups
1983
2,500 cases have been reported in US
1983–84
HIV identified in France & US (54, 200, 321, 441)
1984
First studies indicate AIDS common among heterosexuals in Africa (436, 573)
1984
Research shows that HIV infects T-helper lymphocytes (295)
March 1985
ELISA blood test developed to detect antibodies to HIV. US begins screening donated blood.
1985
HIV isolated in brain cells & cerebrospinal fluid (251, 324)
1985
First controlled clinical trials of anti-HIV drugs begin in US
July 1986
Almost 29,000 cases have been reported by 71 countries
1986
Estimated 5–10 million are infected with HIV worldwide (642)
1986
World Health Assembly recommends global strategy for AIDS control
1986
Several governments start national communication programs
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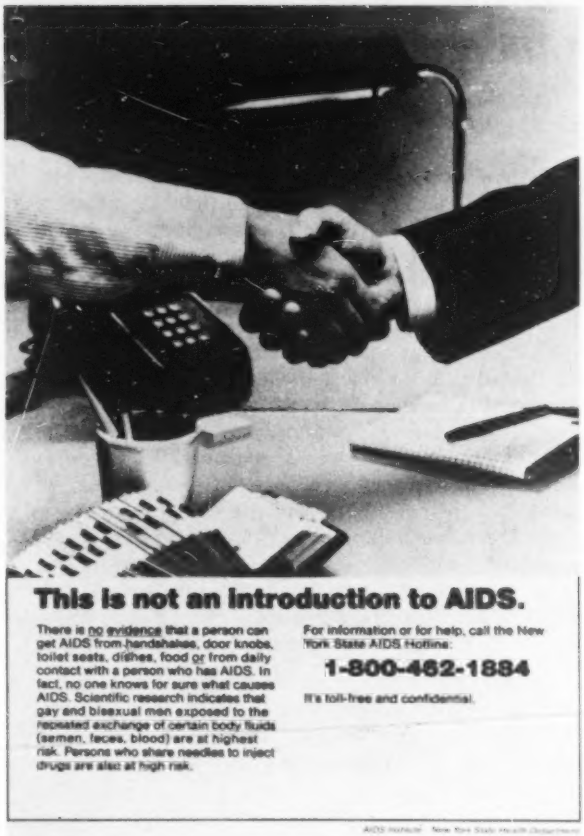

This is not an introduction to AIDS.
There is no evidence that a person can get AIDS from handshakes, door knobs, toilet seats, dishes, food or from daily contact with a person who has AIDS. In fact, no one knows for sure what causes AIDS. Scientific research indicates that gay and bisexual men exposed to the repeated exchange of certain body fluids (semen, feces, blood) are at highest risk. Persons who share needles to inject drugs are also at high risk.
For information or for help, call the New York State AIDS Hotline:
1-800-462-1884
It's toll-free and confidential.

AIDS cannot be transmitted through handshakes, air, food, water, or insect bites. This 1984 poster from the New York State Health Department aims to dispel false rumors about how AIDS is spread but fails to note that women, too, can be infected through coitus.

who is infected (46, 107, 122, 210, 212, 377, 398, 411, 419, 484), especially in an area where HIV infection is very common (72, 209, 377, 484). Among sexual practices, receptive anal intercourse with an infected partner is especially likely to lead to infection (99, 116, 210, 220, 338, 356, 377, 398, 411, 520). The mucosa lining the rectum is delicate and tears easily during anal intercourse (440). This allows infected lymphocytes and virus in semen to enter the tissue and bloodstream of the receptive partner, whether male or female.

The virus is also transmitted during vaginal intercourse. Both male and female partners can be infected in this way. It is not clear whether the risk is the same for both men and women, however (644). Most sexually transmitted diseases are more readily transmitted from men to women than from women to men (108). It is also not clear how readily the virus is transmitted during vaginal intercourse or what the chances are of infection associated with a single act of intercourse with an infected person. In both vaginal and anal intercourse, using a condom reduces the chances of transmission.

It is not known whether other sexual practices, such as oral-genital contact or kissing, transmit the virus (116, 210, 220, 338, 354, 478, 484). Nevertheless, since HIV is found in semen and sometimes in saliva, and since oral-genital contact transmits other infections, most infectious disease experts recommend avoiding these and any other practices that might transfer body fluids.

Heterosexual intercourse may be the major route of HIV transmission in developing countries (339). In central Africa and in Haiti, women are as likely as men to be infected, and female prostitutes are thought to be transmitting the virus to their clients (101, 107, 122, 419, 572). Some 80 percent of African men treated for AIDS in Rwanda and Belgium regularly visited prostitutes, compared with 34 percent of healthy men (122). Similar results have been reported in Haiti and among Haitian immigrants in the US (107, 275, 419). Furthermore, both male homosexuality and anal intercourse are said to be rare in Africa. Reliable information on sexual practices is scarce, however (174, 302, 347, 572, 573). Also, therapeutic intramuscular injections, which might transmit HIV, are common in these areas. Thus it is difficult to determine exactly what percentage of cases are sexually transmitted.

Heterosexual transmission may be common in some areas for several reasons. Sexually transmitted diseases may facilitate transmission of HIV. Chancroid, herpes, and some other sexually transmitted diseases can cause open genital sores, possibly allowing the virus to enter the bloodstream (66, 302, 440, 595). Cervical and vaginal infections often produce a copious discharge in the vagina with a high concentration of lymphocytes—and thus also virus—in a woman infected with HIV. Certain sexual practices also may affect the chances of infection. For example, Zairian prostitutes often put objects into their vaginas. This may cause open sores and infection (347). At the same time, more frequent heterosexual transmission in Africa and Haiti may simply mean that HIV first became established among heterosexual men and women in these areas, in contrast with the US and Europe, where it first became established among homosexual men (339).

In areas or groups where HIV infection is very common, limiting the number of partners may not reduce the risk of sexual transmission substantially (137, 145). Theoretically, the best way to avoid sexually transmitted HIV infection is to avoid intercourse with any person at high risk or believed to be infected. Since it is usually not possible to identify such persons by their appearance, sexual abstinence or consistent use of condoms offers the best protection.

Blood and Blood Products

Transfusion of contaminated blood or blood products can transmit HIV (136, 175, 265, 267, 425). About 2 percent of AIDS cases in the US and about 5 percent in Europe have occurred among hemophiliacs and others receiving contaminated transfusions or blood products (552, 554). Blood transfusions seem to pose a greater risk to infants than to others. In the US, infants receive less than 2 percent of all transfusions but have accounted for about 10 percent of AIDS cases associated with transfusions. This could be because infants' immune systems are immature, because they receive a larger dose of the virus relative to their body size, or because of a shorter incubation period (425). Most developed countries are now screening all donated blood (see p. L-215). Therefore transfusion-related infections will become extremely rare in these countries. Of course, **giving** blood poses no risk to the donor as long as a sterile needle is used.

In some African countries blood transfusions may be an important means of HIV transmission (342, 345, 346). In Zaire, Uganda, and Rwanda, for example, 6 percent or more of samples of donated blood contain antibodies to

Screening Tests for Antibodies to HIV

Current screening tests do not diagnose AIDS. They detect antibodies to HIV in the blood. The presence of these antibodies usually means that a person has at one time been infected with the virus. Since virus has been isolated in many people with antibodies, a positive test is assumed to indicate continuing infection (612). The tests cannot tell whether a person will develop AIDS or other HIV-related symptoms in the future. The most widely used test, an enzyme-linked immunosorbent assay (ELISA), was originally developed to screen donated blood (429). Its use for other types of screening is controversial because many positive results may be false.

The ELISA is the easiest and cheapest test. In the US the cost ranges from $1 to $3 depending on the number of tests being performed (253, 363). A special electronic instrument measures color changes in serum when antibodies are exposed to pieces of HIV (483). The instrument costs between $5,000 and $15,500 (US) (343). The test can be completed in two to five hours (86). It is not technically difficult. The equipment it is not widely available in developing countries. Also, the chemicals used in the test may not be stable in a tropical climate.

The other major test, the Western blot, or immunoblot, is a difficult, lengthy, and expensive procedure, costing up to $90 (US) each (14). This test takes two days and must be interpreted by trained and experienced laboratory workers (86). Less widely used tests include an immunofluorescence assay (IFA), a radioimmunoprecipitation assay (RIPA), and a competitive inhibition assay (163, 253, 544, 620).

How Accurate?

How accurate are these tests? The ELISA is very sensitive—that is, it identifies almost all blood containing antibodies to HIV (true positives). Thus the ELISA is valuable for screening blood and blood products. The test is not so specific, however. It sometimes produces false positives—positive readings on blood that does not contain antibodies to HIV. Thus the ELISA alone is not very valid for screening individuals (103, 253). The ratio of false to true positives with the ELISA is higher in populations where few people have HIV antibodies (41, 429, 564). In a large population of healthy blood donors in the US, for example, only 3 percent of the 10,000 units of donated blood that tested positive with the first ELISA were confirmed as positive with the more specific Western blot test (489).

What causes false positive results? Generally, they occur because the blood tested contains antibodies to the human white blood cells in which the virus is grown for the test. For example, women who have had several children usually have developed antibodies to these cells during pregnancy, leading to false positives on the ELISA (103, 304, 471, 564). Multiple transfusions (even with uncontaminated blood), alcohol-induced liver disease, and some tropical diseases such as malaria and Chagas' disease also may cause false positives (52, 67, 378, 385, 426, 580). Some brands of ELISA kits produce more false positives than others (131, 167).

In contrast to the ELISA, the Western blot test is highly specific, and false positives are rare. Both the US Public Health Service and the World Health Organization (WHO) recommend the Western blot test to confirm a positive ELISA (544, 620). Interpreting Western blot tests can be technically difficult, however, and results may vary among laboratories (41, 93, 620). The test is currently too expensive to be used as the primary test in large-scale screening.

Research is underway to develop more accurate, less expensive tests. WHO is collaborating with major biomedical firms to produce a simple, inexpensive test that can be interpreted easily with the naked eye and can withstand the high temperatures of a tropical climate (50). In the US, research is focusing on tests using viral proteins cloned by means of genetic engineering, instead of a virus grown in human tissue. Such a test is expected to produce fewer false positives (32, 41).

HIV (330, 346, 572). In Zaire studies of adults and children found that those with HIV antibodies were at least twice as likely to have had blood transfusions as those without such antibodies (342, 346).

Not all blood components transmit the virus. Red blood cells, platelets, plasma, whole blood, and clotting factor concentrate may contain the virus (153, 164, 270, 376, 425). Other products prepared from blood—albumin, immunoglobulins (gamma globulins), and hepatitis B vaccine—have not been shown to pose any risk (153, 205, 291, 395, 417, 439, 527, 549, 632). The process of separating and manufacturing these products from whole blood inactivates the virus (153, 437, 439, 565, 589, 598, 632). HIV antibodies may still be present, and recipients' blood can test positive for six months after they receive the product. This does not indicate infection, however (205). Heat treatment during the manufacture of Factor VIII concentrate, a blood clotting agent used by hemophiliacs, also inactivates most of the virus, greatly reducing the risk of infection (323, 430, 466).

Needles

HIV is transmitted among intravenous drug users by sharing needles and syringes in which small amounts of contaminated blood are transferred. Intravenous drug use has been linked with 25 percent of AIDS cases in the US and 8 percent in Europe, and these percentages are increasing (552, 554) (see p. L-196). Of course, persons infected by contaminated needles can then pass on the infection through sexual intercourse, and vice versa.

If needles used for medical injections are contaminated, they may spread infection. While intravenous drug use is rare in developing countries (122, 526), many people take antibiotics and other medications by injection for minor and major illnesses (342, 345, 419, 436). In Zaire, for example, over 80 percent of healthy children and adults had had one or more injections in a 3-year period (342, 345). Traditional healers as well as trained health workers give these injections, and needles are not always properly sterilized. In fact, outbreaks of infectious diseases such as Ebola

hemorrhagic fever have been traced to contaminated needles in clinics (84). Researchers have suggested that contaminated needles in sexually transmitted disease clinics may be an important means of HIV transmission (436, 440, 572, 573). At present, there is no direct evidence for this, however.

It is not clear how important a role medical injections with contaminated needles play in transmitting HIV, in part because injections are so common in developing countries. Two studies in Zaire, one in Rwanda, and one in Haiti have found that people with HIV antibodies or with AIDS had received more injections one to five years before the onset of symptoms than had healthy controls (101, 342, 345, 419). Other studies in several African countries, however, report no difference in the number of injections (122, 302, 436, 498).

There has been no demonstrated transmission of HIV as a result of immunization (249, 608). A Zairian study comparing hospitalized children with HIV antibodies to children without antibodies found no difference in the number of immunizations they had received (342). Immunization workers are expected to sterilize needles, and immunization involves only a few injections (339). Also, subdermal or intramuscular injections used for immunization and to treat illness may be less likely to transmit the virus than intravenous injections, especially as practiced by drug users. Less virus may enter the body, and it usually would not enter directly into the bloodsteam (329).

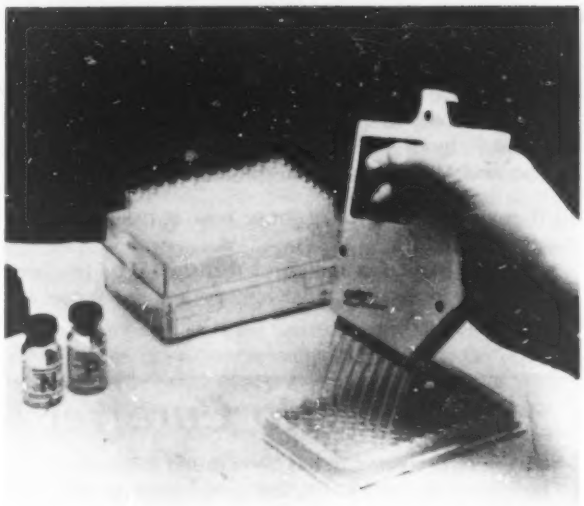
Maternal-Fetal Transmission

HIV can be transmitted from an infected mother to the fetus during pregnancy or childbirth (115, 132, 278, 310, 452, 545, 577). The virus has been isolated in breast milk (528), and there has been one report of a woman, infected by a postnatal blood transfusion, whose breast-feeding infant became infected (629).

How often transmission occurs in pregnancy is not certain. Researchers estimate that 20 to 50 percent of infants born to infected mothers also will be infected (405, 460, 467). Rates are higher among infants of women who previously have given birth to an infected child (31, 494, 495). Large prospective studies are now underway in the US, Haiti, and Africa addressing this and related questions (228, 460). Since many women in some countries are becoming infected, AIDS and other HIV-related illness may become a major threat to child survival.

Transmission by Casual Contact Unlikely

Casual contact or even close family contact has not been shown to spread HIV. To transmit the virus, infected cells or viral particles must pass into the tissue or bloodstream of another person. More than 10 studies involving some 600 family members of people with AIDS in the US, Europe, and Africa show no evidence of transmission of the virus except to sexual partners or to children born to an infected mother (65, 182, 193, 211, 267, 268, 289, 315, 337, 348, 407, 427, 454, 461, 477, 507, 529, 539). Living in very crowded conditions and sharing bathrooms, kitchens, eating utensils, plates, drinking glasses, and personal items such as combs, towels, and even razors and toothbrushes with infected people before and after they developed AIDS have not led to infection (193, 348). There also is no evidence that the virus can be spread in food or beverages (547, 612).



A simple blood test, called an ELISA, detects antibodies to the AIDS virus. The ELISA detects nearly all contaminated blood but sometimes yields false positive reports on uncontaminated blood. Thus a confirmatory test is needed. (Electro-Nucleonics)

Health workers also face little risk of infection even if they have extensive contact with people with AIDS. Only three to six cases of job-related infection have been reported, and researchers disagree about which of these cases truly resulted from occupational exposure (20, 372, 523, 587). Among more than 2,000 health care workers tested in the US and Europe, including more than 400 with needlesticks (accidental puncture wounds with a hypodermic needle) or other exposure to patients with HIV infection, no more than four had HIV antibodies and apparently were not infected through intravenous drug use or homosexual intercourse (241, 248, 372, 478, 482, 539, 555, 556, 587, 617). This amounts to at most 0.25 percent of all these workers and 1.25 percent of those with needlestick injuries. This is considerably lower than the risk of infection with hepatitis b virus. After being stuck with a needle contaminated with hepatitis B, 6 to 30 percent of persons become infected (547). A deep intramuscular wound with a contaminated needle (523) or accidental self-injection of contaminated blood (20) may be necessary to cause infection with HIV. Even workers bitten repeatedly by an AIDS patient suffering from dementia have not developed HIV antibodies (533).

In Zaire 6 percent of almost 2,400 health workers in Kinshasa had HIV antibodies. This rate, however, is the same both in hospital workers who had direct contact with AIDS patients or possibly contaminated instruments and in those who had no such contact (345). This suggests that few, if any, of these infections involved transmission through professional contact with AIDS patients. Both US CDC and WHO have prepared safety guidelines for health workers (see box, p. L-214).

EDUCATION PROGRAMS

Until a cure or vaccine for HIV infection is found (see boxes, p. L-206 and p. L-208), the only way to prevent the spread of disease is by changing people's behavior. The only feasible way to change what is now high-risk behavior with respect to AIDS is through health education and

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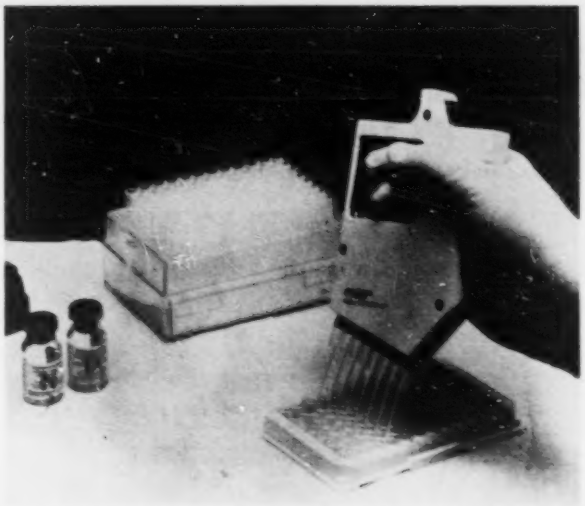

A simple blood test, called an ELISA, detects antibodies to the AIDS virus. The ELISA detects nearly all contaminated blood but sometimes yields false positive reports on uncontaminated blood. Thus a confirmatory test is needed. (Electro-Nucleonics)

Health workers also face little risk of infection even if they have extensive contact with people with AIDS. Only three to six cases of job-related infection have been reported, and researchers disagree about which of these cases truly resulted from occupational exposure (20, 372, 523, 587). Among more than 2,000 health care workers tested in the US and Europe, including more than 400 with needlesticks (accidental puncture wounds with a hypodermic needle) or other exposure to patients with HIV infection, no more than four had HIV antibodies and apparently were not infected through intravenous drug use or homosexual intercourse (241, 248, 372, 478, 482, 539, 555, 556, 587, 617). This amounts to at most 0.25 percent of all these workers and 1.25 percent of those with needlestick injuries. This is considerably lower than the risk of infection with hepatitis B virus. After being stuck with a needle contaminated with hepatitis B, 6 to 30 percent of persons become infected (547). A deep intramuscular wound with a contaminated needle (523) or accidental self-injection of contaminated blood (20) may be necessary to cause infection with HIV. Even workers bitten repeatedly by an AIDS patient suffering from dementia have not developed HIV antibodies (533).

In Zaire 6 percent of almost 2,400 health workers in Kinshasa had HIV antibodies. This rate, however, is the same both in hospital workers who had direct contact with AIDS patients or possibly contaminated instruments and in those who had no such contact (345). This suggests that few, if any, of these infections involved transmission through professional contact with AIDS patients. Both US CDC and WHO have prepared safety guidelines for health workers (see box, p. L-214).

EDUCATION PROGRAMS

Until a cure or vaccine for HIV infection is found (see boxes, p. L-206 and p. L-208), the only way to prevent the spread of disease is by changing people's behavior. The only feasible way to change what is now high-risk behavior with respect to AIDS is through health education and

communication programs that (1) make people aware of the dangers of HIV infection and AIDS and (2) encourage people to take protective measures. To date, only a few countries have begun broad education programs; most are directed only to specific, high-risk population groups. As a result, ignorance and misinformation about HIV infection and AIDS remain widespread.

To change the behavior of those now at risk, education programs need to:

- identify particular audiences that should be reached,
- develop messages most appropriate for those audiences,
- use the best media and most credible sources for reaching them, and
- evaluate and improve these programs by working closely with the intended audiences.

Since HIV is spread in only a few ways and since only a few preventive measures are needed, all audiences in the population need the same basic information about AIDS (see box, p. L-207). Education programs must incorporate this information into various messages that will be easily understood, culturally appropriate, and convincing to each specific audience. Thus the words, the complexity, and the tone of messages will vary, but the same basic information

No Cure Yet Available for AIDS

No effective treatment has been found for the immune deficiency caused by HIV, and no drug has permanently rid the body of the virus. Instead, treatment consists mainly of fighting the specific infections that take advantage of the immune deficiency (see box, p. L-200). These treatments are the same measures taken when these diseases occur in someone not infected with HIV. After treatment stops, however, opportunistic disease eventually recurs (47, 219, 564, 627).

All treatments aimed against HIV are experimental. Researchers are trying (1) drugs intended to keep the virus from multiplying (antiviral drugs), (2) drugs and other treatments to restore the damaged immune system, and (3) combinations of both (306, 308, 362).

Antiviral Drugs

Finding drugs to fight HIV is especially difficult because:

- HIV, like other retroviruses, becomes an integral part of the cells it infects. Therefore the only way to eliminate all the virus may be to kill every infected cell (399, 409).
- The virus can infect brain cells. A natural filter, called the blood-brain barrier, normally protects brain tissue, however. Many antiviral drugs do not readily cross this barrier to reach infected brain cells (53, 71, 251, 324, 502).

Because destroying the virus is impractical, drug therapy has instead focused on preventing the virus from reproducing in the host cell and spreading to other cells. To date, many of the drugs tested have caused serious side effects that may limit their usefulness for treating both symptomatic and asymptomatic persons, especially since HIV infection is chronic and anti-HIV drugs would have to be taken for many years (261, 306, 399). To speed research on anti-HIV drugs, the US government is providing $100 million to 14 research centers for intensified clinical trials beginning in mid 1986 (159).

Of a number of drugs that have been considered, currently azidothymidine (AZT) and ribavirin appear most promising. Both cross the blood-brain barrier, can be taken orally, and in early trials have not caused serious side effects (57, 135, 389). In a US trial of AZT, 15 of 19 patients improved in some laboratory measures of immune response (57, 624). According to a preliminary report after eight months of a multicenter trial, only one of 145 patients receiving AZT had died compared with 16 of 137 receiving placebos. In both studies AZT recipients showed improved clinical signs, such as weight gain. Long-term effects are not known. As of September 1986 AZT is being made available in the US to AIDS patients with *pneumocystis carinii* pneumonia. In a short-term trial of ribavirin, the number of T-helper cells doubled in four of the five AIDS patients treated (135).

Several other drugs also may hold promise. They include ansamycin, cyclosporine A, alpha interferon, and dideoxycytidene, a relative of AZT. Studies are being planned (172, 240, 246, 306, 564, 581).

Another promising treatment strategy involves drugs designed specifically to attack the *trans*-activator (*tat*) gene of HIV. Without the *tat* gene the virus may not be able to reproduce. Also, it is believed that drugs that prevent this gene from working might be less toxic because of their possibly selective action (184, 464).

Immune System Repair and Replacement

If the virus can be kept from multiplying, it may be possible to restore resistance to opportunistic infections either by repairing the damaged immune system or by replacing destroyed immune cells. The most common repair treatments have been gamma interferon and interleukin-2 (306, 564, 579). Immune replacement treatments have included lymphocyte transfusions, bone marrow transplants, and thymic implants (172, 215, 333, 458, 469).

Thus far, neither repair nor replacement has been demonstrated to correct the underlying immune defect permanently. Short-term and minor improvement in immune reaction has occurred in some cases. If the virus is not eliminated, however, it eventually attacks the immune system again (306, 308, 334, 463). Bone marrow transplants from an identical twin, along with previous lymphocyte transfusions and treatment with suramin—an antiviral drug now considered too toxic for general use (114, 288, 463)—appeared to eliminate the virus in one of three AIDS cases so treated (172, 469). While this therapy would only rarely be feasible, it may point the way to a more useful treatment. Combining antiviral treatment with immune repair or replacement may eventually offer better results than have generally been achieved to date, especially if treatment can be started before the virus has caused severe damage (306, 564).

Basic Information About AIDS

1. AIDS is a fatal disease that cannot now be cured.
2. AIDS is **not** spread by casual contact.
3. AIDS is spread by sexual intercourse, by contaminated blood, and by contaminated hypodermic needles.
4. An infected woman can give AIDS to her child during pregnancy.
5. A stable, faithful relationship with another uninfected person is safest. In any case, reducing the number of sexual partners reduces the chances of getting AIDS.
6. For the sexually active, always using condoms is good protection against AIDS.
7. A person can look and feel healthy and still be able to spread the infection that causes AIDS.

must reach everyone. To be easily understood and remembered, these messages must often simplify some of the complex issues regarding AIDS. More detailed explanation must be left for counseling sessions, where the explanation can be more closely tailored to the client.

In addition to messages designed for a very broad audience, programs should be designed for certain key audiences. The audiences most needing education may vary in different countries. Identifying some of them requires national and regional research. Key audiences to consider for education programs include:

- high-risk groups—homosexual and bisexual men, hemophiliacs, male and female prostitutes, clients of sexually transmitted disease clinics, people with many sexual partners, users of intravenous drugs—and the sexual partners of those in any of these groups;
- young people, including those about to enter puberty;
- parents;
- teachers;
- employers;
- the media;
- policy-makers;
- blood donors.

Family planning providers and other health workers need special education programs as well (see pp. L-212–215).

Ongoing Education Programs

Broad, large-scale education programs about AIDS are needed so that everyone knows how to protect oneself and others. For example, many people do not know that condoms can protect against contracting and spreading HIV infection. Also, widespread public information programs can combat unfounded fears and prejudices. For example, many people still believe that they can be infected by nonsexual casual contacts or by **giving** blood, even though this is not the case (81, 371).

Large-scale education programs for the general public have only recently begun. In Switzerland in March 1986 the government distributed 10-page pamphlets on AIDS to all households in the country. The pamphlets are printed in the four national languages. Additional copies are available free in every post office (422). A randomized telephone survey of more than 1,000 people in May 1986 found that 75 percent had read the pamphlet (515). In the United Kingdom (UK), New South Wales (Australia), and New Zealand, public education programs have been designed with the help of commercial advertising agencies. In the UK the national government began a $2.5 million (US) campaign in March 1986 with a series of large advertisements in all national newspapers. The ads describe the natural history of HIV infection and offer guidelines for prevention. Telephone information services, posters, and leaflets are planned (24). The health department of New South Wales and the New Zealand AIDS Foundation are designing multimedia campaigns expected to cost $500,000 to $600,000 (US). The Australian program will feature radio spots and advertisements promoting condoms. The governments of West Germany and the Netherlands are considering similar campaigns (358). In the US very few educational programs have focused on informing a wide audience. In 1986, however, the national government is budgeting $29 million for education programs, and many states are using these funds to begin campaigns. In some areas messages will be broadcast on television and posted on billboards (158). Some private organizations such as the American Red Cross have developed films, slide shows, and other educational materials for general use or to be adapted to specific audiences (297).

In Latin America the Brazilian Ministry of Health has broadcast television commercials during Carnival to encourage the use of condoms (73). In Chile since 1984 the government has funded an AIDS hotline that has received over 300 calls a day, mostly from men (625). In Africa 11 countries have placed information about AIDS in newspapers, radio, and television (602, 606). In Uganda the Health Ministry has distributed posters to hospitals and clinics. The posters recommend using condoms and limiting the number of sexual partners (75).

MUJERES
AIDS
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Vaccine Against AIDS Is Years Away

Vaccines contain harmless variants of disease-causing organisms. These variants trigger the immune system to produce protective antibodies—specialized proteins that recognize and attack the disease-causing organism if it enters the body later. A vaccine against HIV, the virus that causes AIDS, is still years away. Much work is under way, however.

Developing a vaccine against HIV is especially difficult for two reasons. First, although some persons naturally produce antibodies to HIV that are weakly protective, these antibodies generally do not destroy the virus (314). This does not necessarily mean that vaccine-induced antibodies will not destroy the virus, however, since they may be quite different from those induced by the natural virus (189). Second, the genetic structure of the virus varies from one strain to another—especially in its outer coat, or envelope region, which in most viruses is the part neutralized by antibodies. In addition, because HIV mutates rapidly, new strains are continually developing. Therefore a vaccine derived from the viral envelope of one strain might not protect against others because the immune system would not recognize them (63, 144, 180, 364, 373, 597). Researchers have recently discovered, however, that a portion of the envelope may remain unchanged in all strains. A vaccine that induced production of antibodies that recognized this portion and inactivated the virus might be effective against all strains (144).

The most promising approach to developing a safe and inexpensive vaccine may be recombinant DNA technology, popularly called gene splicing (180, 189). Three possible uses of gene splicing are currently being explored:

- Researchers hope to separate out just the part of the envelope gene that remains constant among strains. The envelope gene has recently been spliced to the harmless vaccinia virus used in smallpox vaccine. Mice injected with this combination virus produce antibodies to HIV envelope proteins, but it is not yet known if the antibodies can destroy HIV (6, 40, 110, 254, 300).
- Researchers may be able to develop a vaccine that will induce antibodies to attack the inner core (*gag*) proteins of the virus, which apparently vary less than the envelope proteins. Researchers have recently found that antibodies to a man-made version of a natural human hormone called thymosin α_1 attack the *gag* proteins (242, 480).
- Another possible strategy is to remove the *tat* gene that enables HIV to multiply. A virus thus altered might induce production of protective antibodies but not cause disease (184, 464).

Research on these possibilities is just starting. While some may prove valuable, most researchers agreed in mid-1986 that a vaccine is at least several years away (155, 432). Furthermore, the vaccine would prevent infection, but it probably could not be used to prevent disease in those already infected (568).

Newly discovered viruses similar to HIV may provide clues to vaccine development. In early 1986 researchers discovered a virus genetically similar to HIV. This virus, named human T-cell lymphotropic virus-IV (HTLV-IV), has for several years infected humans in Senegal but apparently has not yet caused disease (283). HTLV-IV may be closely related or identical to another virus, named lymphadenopathy-associated virus-II (LAV-II), which also was discovered in early 1986. LAV-II does appear to cause AIDS-related disease, however (117, 415). Related viruses also have been found in monkeys (284). If persons infected with HTLV-IV prove to be resistant to infection with HIV, this may suggest yet another approach to vaccine development. Research in this area is very preliminary, however.

Issues in Vaccine Testing and Use

Even if a vaccine is developed, several questions must be answered before it can be widely used. First, on what animals and for how long will researchers test the vaccine? The chimpanzee is the only nonhuman primate easily infected with HIV, but chimpanzees are scarce and expensive. Furthermore, they apparently do not actually develop AIDS, although they sometimes develop lymphadenopathy, a common symptom of HIV infection (see p. L-198) (38, 189, 190, 198, 300).

Second, who will be the first humans to receive the vaccine, and how can they be monitored to assess its efficacy? Researchers would have to monitor sexual activity and intravenous drug use among volunteers very carefully for many years. In any case, volunteers might be reluctant to abandon safe sexual practices and adopt high-risk practices to test an unproven vaccine. Because side effects could be severe, high-risk individuals might be reluctant to volunteer for vaccine trials.

Third, would drug companies be willing to market a vaccine, given possible legal liability?

Fourth, who should routinely receive the vaccine if it is approved? Safety, efficacy, and cost of the vaccine would have to be weighed against the risk of infection for various groups. In North America and Europe the vaccine would probably be recommended for uninfected persons in high-risk groups, but others, such as some health care workers, might want the vaccine as well. Recommending who should be vaccinated would be more difficult in areas where high-risk groups are not well-defined. In any case, delivering a vaccine to enough people to halt, or even slow, transmission will be an enormous challenge, especially since the virus is spreading quickly (40, 189, 255, 409, 410).

"A vaccine for general use is not anticipated before the next decade and its use would not affect the number of persons infected by that time."

US Public Health Service Plan for the Prevention and Control of AIDS and the AIDS Virus: Report of the Coolfont Planning Conference (568)

"Control of AIDS and [HIV] infection cannot await future research. There is urgent need for community groups and health professionals to work together and utilize the tools available to prevent AIDS and care for its victims."

James W. Curran, US CDC (137)

The most important special audiences for education programs are members of **high-risk groups and their sexual partners**. They need information immediately to help them reduce the chances of contracting and transmitting the virus. In the US several city health departments and local AIDS organizations, some with assistance from the US CDC, have developed programs (39, 158). In fact, the first information efforts were local, beginning in 1982 in the US. Often created and funded by community organizations and foundations run by and for homosexuals, these programs have been staffed largely by volunteers. They have used various approaches including mass media, telephone hotlines, and peer group counseling (318). Similar programs are under way elsewhere. One example is the Ankali Project in Sydney, Australia. The project maintains an AIDS hotline staffed by 25 volunteers. The hotline has received more than 1,000 calls per week since it opened in August 1985. In addition, a van, staffed by a nurse and a counselor, parks on major city streets every night from 9 p.m. to 7 a.m. The staff provides counseling, HIV antibody testing, and free condoms (213).

Intravenous drug users are an important audience for education programs. In several US states, state health agencies are warning drug abusers not to share needles. In New Jersey and Maryland, for example, former drug addicts counsel current users in drug treatment programs. Posters and brochures are handed out in the streets and have been placed in buses and hospital emergency rooms (499, 582). In New York posters appear in subways and in "shooting galleries"—areas where drug addicts go to find needles for injecting drugs (21). In Florida recorded telephone messages provide information for drug users (13). The Health Education Resource Organization (HERO) of Maryland, a largely volunteer organization, has developed educational videotapes on AIDS for prison inmates, many of whom are intravenous drug users (82).

Male and female prostitutes may be repeatedly exposed to HIV and also may transmit the virus to their clients. In several African countries high rates of infection have been reported in female prostitutes and their clients (see Table 1, pp. L-219–220). In Nairobi the Ministry of Health began funding an educational program for female prostitutes in mid-1986. Along with basic information, the women receive free condoms (509). Getting the clients of prostitutes to use condoms is difficult, however. Unless those who go to prostitutes know the risks involved, prostitutes may be forced to choose between protecting themselves from infection and making a living.

Students and other young people need to know about AIDS and other sexually transmitted diseases, as well as the health risks of pregnancy for very young women, in order to make informed choices about their behavior. The US Public Health Service recommends that "national information and education campaigns on AIDS and HIV infection should be targeted to . . . adolescents and preadolescents" along with other key audiences (568). Educational programs are especially important for male homosexual adolescents who are just becoming sexually active and for young people experimenting with drugs. These youths are unlikely to seek information on such sensitive issues from adults (150). A few US cities—Los Angeles and Baltimore among them—require education about AIDS for all students beyond primary school. Elsewhere in the US few schools offer AIDS education (192). By contrast, in Sweden all middle and upper schools teach students basic facts about AIDS. Videotapes and print materials geared to adolescents have been prepared by government agencies (422). In Switzerland plans are being made to develop an information program on AIDS and other sexually transmitted disease for adolescents just leaving school (515).

Teachers may feel uncomfortable talking about sexually transmitted diseases and the sexual practices that spread them. Since sex education and family life education are not included in the curricula of teacher training colleges in most countries (616), teachers may not be prepared to teach sexuality or to discuss AIDS in their classrooms. Programs to train middle and upper school teachers are underway in a few areas in the US. In New York, for

Five Recommendations About Sex and AIDS

1. Seek a mutually faithful relationship with one partner, or at least limit the number of sexual partners to reduce the chances of getting AIDS and other sexually transmitted diseases.
2. Do not have intercourse with someone who has had many sexual partners.
3. Remember that both vaginal and anal intercourse can spread AIDS.
4. Always use condoms or insist that your partner use them if there is any risk of infection. Protect yourself; protect your partner.
5. Remember that a person can look healthy but still spread AIDS.

Special Recommendations for High-Risk Groups

1. Follow recommendations about sexual practices (see box, this page).
2. If you might be infected, think carefully before getting pregnant or getting your partner pregnant. An infected woman can give AIDS to her baby before it is born.
3. Do not share needles with anyone else. Do not use anyone else's needles. If this is not possible, sterilize needles and syringes before using them.
4. Do not donate blood, semen, or body organs.
5. To be extra safe, do not share razors, toothbrushes, or other items that could be contaminated with blood.

"The problem of AIDS is critical. The response to AIDS will require developing countries to divert precious resources that already are stretched to the limit."

M. Peter McPherson,
Administrator, US AID (536)

example, 100,000 teachers attended a citywide training seminar in 1985. Plans to include AIDS in the curricula are in progress (192). In Sweden a printed guide about AIDS has been produced for teachers (422).

Parents need help talking with their children about AIDS, sexuality, and drugs. They should know the important facts about AIDS. They may also need help so that they will feel more comfortable talking to their children about these problems in a sympathetic and reassuring way (150). To date, no such programs have been developed.

Employers need to know about AIDS so that they can develop appropriate policies regarding employees with HIV infection, provide accurate information to their employees, and ensure confidentiality. increasing numbers of US corporations are starting to inform workers about AIDS. Some such programs have included guest lecturers, films, and brochures distributed to all workers (517). Unions also are educating workers. In the US the Service Employees International Union, for example, has distributed 150,000 pamphlets on AIDS to its members, many of whom are health workers (78).

The **media** play a crucial role in most countries in spreading information. False, misleading, or incomplete reports about AIDS can spread rumors and increase public confusion and fear (112, 151, 177). Special briefings for journalists, radio and television broadcasters, and other media figures help to encourage the communication of accurate information. In a few US cities, for example, public health officials have sponsored conferences on AIDS specifically for local media. In response the media have been more willing to publish addresses and phone numbers of organizations providing information about AIDS (371).

Policy-makers are always an important audience. They have the basic responsibility to allocate funds and establish regulations for various programs. At present some policy-makers may not recognize that AIDS threatens a large part of the population (286). Perhaps concerned about the costs involved, about the need to protect individual rights, about discouraging tourists, or about creating widespread panic, many officials have been reluctant to undertake the widespread disease surveillance and education programs that could limit transmission.

Blood donors must know that HIV can be spread by donated blood that is contaminated. People in high-risk groups or who think that they might be infected must not give blood, even if relatives ask for donations. When screening tests are not available, educating potential donors is the best way to protect the blood supply. Donors also must be reassured that **giving** blood is **not dangerous** when a sterile needle is used.

Impact on Behavior

Apart from the high levels of media coverage, most education efforts concerning AIDS are too new to show results. Few have been carefully evaluated (276, 279, 490, 591). Of course, the impact on AIDS and other HIV-related illnesses will be difficult to gauge because of the long incubation period of the infection. Nevertheless, in the US there is evidence that high-risk groups are getting information and beginning to change their behavior. For example, in New York City gonorrhea rates among men age 15-44 dropped from 129 new cases per 100,000 in 1980 to 74 per 100,000 in 1983 (490). In contrast, gonorrhea rates among women age 15-44 increased between 1980 and 1983 (490). In one San Francisco study of homosexual men, an average of 17 percent developed antibodies to HIV each year between 1982 and 1984. The rate dropped to 4 percent in 1985 (594). In the US and Canada homosexual men report that they are changing their sexual habits either by reducing the number of partners or by avoiding anal sex (217, 230, 375, 413, 443, 485). Thus the extensive press coverage on AIDS, as well as the targeted education programs, appears to be having some effect. Nevertheless, the fact that many men and women are still contracting sexually transmitted diseases and that some continue to practice high-risk sexual behavior underlines the need for continuing efforts (413).

A survey of 261 intravenous drug users in New York City also suggests that they have learned about AIDS. Almost all respondents knew that sharing needles could spread HIV, and 66 percent reported that they are now trying to use sterile needles and not share needles (496).

Special Education Problems with AIDS

To be effective, an education program must take account of all factors—cultural, political, and scientific—that may affect its success. In addition to the fact that AIDS usually involves sexual behavior, a number of problems make communication about AIDS difficult.

1. Most people infected with HIV have no symptoms yet presumably can transmit the virus to others. Education programs must persuade these people not to spread an infection that they may not even know they have. They also must convince people that someone who appears perfectly healthy can transmit a deadly virus. (Fortunately, the same guidelines to prevent transmission apply both to the infected and the uninfected.) In addition, educational messages have to make clear that, unlike many other sexually transmitted diseases, AIDS is a fatal disease and cannot be cured.

2. Some of the people at high risk of AIDS—intravenous drug users, male and female prostitutes and their clients, and in some areas homosexual men—are difficult to reach through conventional channels of communication. Few organizations represent these groups, and social norms and legal barriers may separate them from most community organizations and institutions. Consequently, group meetings, open discussion, and other educational efforts are hard to organize. Also, these audiences may not trust doctors, counselors, and community leaders who are respected sources of information to other people.

3. People in high-risk groups may not see themselves as such. For example, men who only occasionally have sex with other men or people who use intravenous drugs only occasionally may not think of themselves as homosexuals or drug users and so may not believe that they are at risk of infection (158). Messages that focus on the risky behavior, rather than on high-risk groups, can reach more people more effectively. For example, the American Red Cross

Using Condoms to Prevent AIDS

Can condoms protect against AIDS? Recent laboratory tests and preliminary studies of humans suggest that they can.

In laboratory tests, both latex and natural lambskin condoms were filled with fluid containing a high concentration of HIV—5,000 times greater than found in semen. The condoms were subjected to pressure and left in a beaker of fluid for three weeks. None of the virus leaked through the condom into the surrounding fluid (127).

These results are not surprising. Similar laboratory tests performed on other viruses of roughly the same size as HIV yield the same results (128, 292). It is well established that condoms prevent the spread of many sexually transmitted diseases, including gonorrhea, syphilis, and chlamydia (see **Population Reports**, *Update on Condoms—Products, Protection, Promotion*, H-6, September-October 1982, and *Infertility and Sexually Transmitted Disease: A Public Health Challenge*, L-4, July 1983).

Evidence from studies of humans is just starting to emerge. A study in the US followed 24 uninfected sexual partners of people diagnosed with AIDS to see how many became infected over a 3-year period. Among the 10 couples who used barrier methods (condoms, spermicides, or diaphragm and spermicidal jelly), only one partner became infected. (Separate data on condom users are not available.) In contrast, among 14 who did not use barrier methods, 12 became infected (182). Similar results are reported in Zaire. None of 8 prostitutes who reported that at least half of their clients used condoms had antibodies to HIV, compared with 34 percent of 77 prostitutes who said that less than half or none of their clients used condoms (347).

Large epidemiologic studies among homosexual men using condoms are underway in the US (289). These studies should provide more evidence on the effectiveness of condoms. They may also show whether condoms are more likely to break during anal intercourse than during vaginal intercourse and whether various lubricants that users may put on condoms damage the latex (145).

The only sure ways to avoid exposure to HIV through sexual activity are either: (1) to abstain from sexual intercourse entirely or (2) to have a mutually faithful relationship with an uninfected person. In the absence of these, however, consistent and correct use of condoms with every act of vaginal or anal intercourse is the best protection. People who may be or may have been exposed to the virus should always use condoms, even if they are also using other methods of contraception. Likewise, people who test positive for antibodies to the virus should always use condoms, if they are sexually active, in order to protect their partners.

Condoms may have additional benefits for people infected with HIV. Condom use may slow the progression of disease in an infected person by reducing exposure to semen, to additional doses of the virus, and to other sexually transmitted diseases. Avoiding such exposure prevents stimulation of an immune response, which might increase viral reproduction (see box, p. L-198).

Condom Use and Availability

Condoms can help protect against AIDS only if they are available and used. Condoms are not widely used in most countries. Although at least 40 million couples worldwide rely on condoms for family planning, over one-fourth of these users are in Japan, another two-fifths are in other developed countries, and about one-fifth are in China. Thus all the rest of the world accounts for less than one-fifth of all condom use (see **Population Reports**, *Update on Condoms—Products, Protection, Promotion*, H-6, September-October 1982). In areas with many cases of AIDS, such as central Africa and Haiti, surveys report that condom use is quite low: only one percent or less of married women say that they rely on condoms (see **Population Reports**, *Fertility and Family Planning Surveys: An Update*, M-8, September-October 1985). Many of the surveys on which these estimates are based did not query men, and they were conducted before AIDS was known. It is not yet clear whether worldwide patterns of condom use are changing in response to AIDS.

Condoms are not always easy to get. In Latin America, most of Asia, the Near East, and developed countries, condoms are available, at least in cities. In many rural areas worldwide, however, and particularly in many African countries, condoms are in short supply (330, 444, 445, 508). Although condom manufacturers sell their products in many countries, these condoms may be too expensive for most people (506). Sales to most African countries are very slight (508).

The United States Agency for International Development (US AID) supplies 85 to 90 percent of all noncommercial condoms distributed worldwide. In 1985 and 1986 US AID has provided about 500 million condoms each year (76), or enough to protect about five million couples regularly. International donor organizations also supply condoms to many areas. In 1985 the United Nations Fund for Population Activities sent 7.2 million condoms to Asian countries and 1.44 million to sub-Saharan African countries (442).

Because condoms are a safe and effective family planning method, efforts to encourage their use are underway. For example, a social marketing program covering all 19 states of Nigeria includes promotion and sales of condoms. Use of condoms to prevent AIDS is not mentioned, however, nor is it a goal of the program (296).

The protection that condoms offer against HIV infection and other sexually transmitted diseases is an important reason for family planning programs to encourage condom use. In fact, as people learn more about AIDS, the demand for condoms may increase. In the US, sales of condoms recently have grown sharply, especially in California and New York, the states with the most cases of AIDS (379). Ensuring that condoms are readily available to all who want them is an essential part of AIDS prevention.

changed its information for potential blood donors from urging that homosexuals should not donate to urging that any man who had had sex with another man should not donate. After this change the proportion of donations that tested antibody-positive declined (297).

4. Many associate AIDS with practices often regarded as immoral or illegal—homosexuality, drug abuse, prostitution. As a result, policy-makers in some countries have refused to support educational or even service-delivery programs. In the US, for example, county supervisors in Los Angeles, California, stopped distribution of brochures that warned drug users not to share syringes. They argued that the brochures promoted drug use (13, 239).

5. Some groups may consider open discussion of risk factors or preventive measures unacceptable. In the US, it was not until mid-1985 that newspapers clearly explained that unprotected anal intercourse transmits HIV or that condoms can prevent transmission (151). Many radio and television broadcasts still do not deal with these important points. Local US groups receiving US CDC funds for education on risk reduction are instructed to use language that the intended audience will understand but that is "unoffensive to most educated adults beyond that group." Pictures of the genitals are not permitted in audiovisual material (542).

6. Political controversies over the origin and discovery of HIV have diverted attention from education and research. The origin of HIV has become a subject of an intense international controversy. While its origin is unknown, some researchers have hypothesized that it originated in Africa—perhaps as a variant of harmless viruses found in monkeys and humans (52, 283, 400, 415). This hypothesis has been attacked in the African press, which has accused Western scientists of racism and outright falsification (5, 404, 590). The controversy has impeded research and publication of information about AIDS in Africa (639). At the same time, US and French researchers are competing for credit for isolating the virus. As a result there are rival names for the virus (see box, p. L-201) and perhaps less than a full exchange of information on research findings (633).

7. Much is unknown about HIV infection and AIDS. As information accumulates, some messages may have to be changed. This may cause public confusion or mistrust. In particular, because it is not certain whether some sexual practices transmit the virus, current guidelines discourage deep kissing and oral-genital contact, even though the risk may be very low. Overly restrictive guidelines may make compliance more difficult, but overly permissive guidelines might allow further spread of infection (145).

IMPLICATIONS FOR HEALTH SERVICES

Health workers have a crucial role to play in preventing AIDS and are an important audience for education programs. Both what they tell their clients and how they provide various health services are important. They must:

- inform and advise clients,
- promote condom use and other practices that prevent transmission,
- adopt practices that prevent transmission in health care settings,
- keep blood supplies free from contamination, and
- join in AIDS surveillance programs.

Since sexually active adults and their infants face the greatest risk of infection, the health services that care for them—family planning, maternal and child health, and sexually transmitted disease programs—have a great opportunity and responsibility to slow the AIDS epidemic.

All health workers—not just physicians—need information. Pharmacists, for example, are a major source of health and family planning information in developing countries. Pharmacists can encourage condom use and other preventive measures, provide educational materials, and refer customers to health centers for evaluation and counseling. Traditional practitioners who give injections should be trained to sterilize needles, syringes, and other equipment properly. Health care authorities must overcome any reluctance to work with these practitioners if AIDS is to be controlled.

Many health workers are poorly informed and very anxious about AIDS. A 1985 US study found that more than half of 1,200 health workers in an urban hospital wrongly thought that the virus could be transmitted by casual, nonsexual contact; 20 percent wrongly thought it could be transmitted by a sneeze. Some 25 percent sometimes avoided public places for fear of contracting AIDS. An equal percentage admitted extreme anxiety about working with AIDS patients (592). Health workers in other US hospitals and in Africa also are reported to be very concerned about treating people with AIDS, and in some cases they have refused to do so (336, 531).

Education programs for health workers are underway in many countries. In the US, local AIDS organizations have given in-service training to health workers in hospitals and extended care facilities and have prepared pamphlets for health care providers (82). The American Medical Association is conducting seminars for physicians on medical and health care aspects of AIDS, controversies over antibody screening, and financial consequences (12). In Africa at least nine countries have held workshops for health workers (602, 606). For example, the Kenya Medical Research Institute organized a national workshop for senior physicians from around the country and provincial workshops for other medical staff in all provinces (3).

As the first source of health care for many people, family planning programs have a major responsibility for helping to stop AIDS. Their clients need the facts about AIDS and encouragement to use condoms if they face any risk. (Ann Jimerson, JHU/PCS)

Instructions for Condom Users

For maximum protection, condoms must be used correctly. Health workers should not assume that people know how to use condoms. All condom users should receive very clear and explicit instructions:

- Use a condom every time you have intercourse.
- Always put the condom on the penis before intercourse begins.
- Put the condom on when the penis is erect.
- Do not pull the condom tightly against the tip of the penis. Leave a small empty space—about one or two cm—at the end of the condom to hold semen. Some condoms have a nipple tip that will hold semen.
- Unroll the condom all the way to the bottom of the penis.
- If the condom breaks during intercourse, withdraw the penis immediately and put on a new condom.
- After ejaculation, withdraw the penis while it is still erect. Hold onto the rim of the condom as you withdraw so that the condom does not slip off.
- Use a new condom each time you have intercourse. Throw used condoms away.
- If a lubricant is desired, use water-based lubricants such as contraceptive jelly. Lubricants made with petroleum jelly may damage condoms. Do not use saliva because it may contain virus.
- Store condoms in a cool, dry place if possible.
- Condoms that are sticky or brittle or otherwise damaged should not be used.

Counseling and Patient Care

Family planning workers and all other health workers need to teach clients how to avoid HIV infection. All clients should know that HIV infection is transmitted by sexual intercourse and by contaminated blood and needles. Explaining and encouraging safe sexual practices for both men and women are vital—particularly encouraging consistent and correct use of condoms (see box, this page).

All health workers should know the signs of HIV infection and related disease that are common locally. People with these signs as well as those with a positive antibody test should be referred for medical care and counseling. Health workers need to pay special attention to clients who may be at high risk for infection, whether or not antibody testing is available.

People who may be infected and their sexual partners need careful, confidential counseling. This should include explanations of symptoms and diseases that some infected people develop and the chances of developing AIDS. Infected people should know that, while they may not develop AIDS and they may not even feel sick, they can still transmit the virus to others. Thus they need very clear information about preventing HIV transmission. They must be encouraged to follow safe sexual practices faithfully or to abstain from sexual contact (538).

Counseling men and women who may be infected requires patience and skill as well as knowledge. These people may be anxious, depressed, or even suicidal. Some may be so depressed that they are unable to work (386, 391). Counseling may be difficult for some health workers, especially if they have not studied human sexuality during their training. Some may feel uncomfortable talking about sexual matters with clients, particularly homosexuals or prostitutes and their customers (336, 412). Training programs in counseling are starting in some areas.

In some developing countries HIV infection is as common among women as among men. Thus infection of the fetus during pregnancy or birth may become a major cause of infant morbidity in these areas. Women at risk of infection—that is, in areas where AIDS has been found, women who have had more than one sexual partner or a partner with more than one partner—need special information. They need to understand that HIV infection can be transmitted to the infant and that pregnancy might trigger symptoms in an asymptomatic infected woman (see p. L-201). These women should have an antibody test, if possible. Women whose test results are positive should be urged to prevent pregnancy, at least until more is known about maternal-fetal transmission (545). Health care workers must tell a woman at risk to be sure that her partner uses condoms both for his protection and to prevent pregnancy (258). If that is not possible, these women should use another effective method of contraception. The WHO Workshop on AIDS in Central Africa in 1985 concluded, "All measures aimed at restricting reproduction in seropositive [infected] women must be encouraged" (622).

The pregnant woman who is infected with HIV needs regular prenatal care because opportunistic infections may develop during pregnancy. Condoms should be used throughout pregnancy to prevent any further exposure to HIV (1). US CDC recommends that infected women not breast-feed (545), but this recommendation may not be applicable where safe bottle-feeding is impossible. In view

Can Spermicides Help Prevent AIDS?

In laboratory tests nonoxynol-9, the spermicidal agent used in most contraceptive foams, tablets, and jellies, inactivates HIV, the AIDS virus (244). Beyond this, little is known about whether spermicides could help prevent AIDS, and little or no research is underway.

A number of important questions await answers: (1) Will the foam or gel carrier interfere with the action of nonoxynol-9 on HIV? (2) Will the spermicide disperse enough to kill all the virus? (3) What dose of spermicidal agent is needed to be sure that HIV is inactivated? (4) Are spermicides as safe for use in the rectum as they are when used in the vagina?

With so great a need for practical protection against AIDS, spermicides should not be neglected. Answers to these questions are urgently needed, especially for women who cannot rely on their partners to use condoms.

of the possible risks of pregnancy to both mother and child, some researchers suggest that infected women should consider terminating their pregnancies (337, 434).

Maternal and child health workers also must be alert to signs of HIV infection in infants and young children (see box, p. L-200) so that they can treat bacterial and opportunistic infections promptly. Parents and others who care for infected children need to be told how to wash themselves carefully after exposure to the child's body fluids and excrement in order to avoid any risk of infection (541).

Concerns have been raised that live-virus vaccines, such as the measles, oral polio, and BCG vaccines, may be dangerous for those with HIV infection. These vaccines often are not given to people with suppressed immune systems for fear that they may actually cause the diseases that they were meant to prevent (541, 569). How risky these vaccines are to an HIV-infected individual is not clear. In the only reported case to date, a man developed vaccinia (cowpox) after receiving a smallpox vaccination (179). Two small studies in the US and Haiti, however, report no ill effects in 78 apparently infected children who received oral polio vaccine and/or measles vaccine (229, 530).

It is not clear whether immunizations will be effective in those infected with HIV. Very small US and Haitian studies suggest that most children with AIDS may not receive protection from immunizations but that some children with less severe HIV-related conditions may be protected, at least to some extent (77, 229, 635).

Guidelines for Preventing Transmission of HIV and Other Bloodborne Infections in Health Care Facilities

- All needles, scalpels, and other sharp instruments should be considered potentially contaminated and handled with extraordinary care.
- Disposable syringes and other sharp items should be placed in a puncture-resistent container located as close as possible to the treatment area. Later they should be destroyed to prevent reuse.
- To reduce needlestick injuries, needles should not be recapped after use.
- If workers may be exposed to possibly contaminated blood or other body fluids, they should wear gloves and, for surgical procedures, gowns, masks, and eye-coverings. After contact with blood, workers should wash immediately.
- Blood and other specimens from patients known or suspected to be infected with HIV should be labeled promptly with a special warning. Blood spills should be cleaned up immediately with a disinfectant.
- Mouthpieces, resuscitation bags, and other ventilation equipment should be available to minimize the need for mouth-to-mouth resuscitation.
- Although pregnant workers are at no greater risk of contracting HIV infection, they should be especially careful, not only because HIV infection could be transmitted to the fetus if the woman became infected, but also because cytomegalovirus and other opportunisitic infections associated with AIDS can cause birth defects whether or not the woman is infected with HIV (273, 473).

Source: adapted from US CDC (547), WHO (612)

Preventing Transmission in Clinics and Hospitals

By taking certain precautions, health care workers can minimize transmission of HIV in health care facilities both to themselves and to other patients. HIV is spread in the same ways as hepatitis B virus. Therefore the same techniques that contain hepatitis B virus also are effective against HIV (42, 202, 367, 473, 547).

The risk that health workers might acquire HIV from an infected patient is almost nonexistent (612). To date, only three to six health workers in the US and UK, among the thousands who have cared for AIDS patients, are thought to have become infected with HIV as a result of their work (see p. L-205). To minimize even this slight risk, all health care workers should avoid direct contact of their skin or mucosal membranes with the blood and other body fluids of people infected with HIV. US CDC and WHO guidelines for preventing transmission of HIV and other bloodborne infections are summarized in the box on this page.

Obstetricians and others who deliver babies are often exposed to blood and tissue and so must follow safety precautions faithfully. If possible, they should wear gloves and gowns when handling the placenta and the infant until blood and amniotic fluid are cleaned off the infant's skin (546).

To date, there is no evidence that an infected health care worker has infected a patient (547). To insure that this does not occur, wherever possible, (1) all infected health workers should wear gloves when touching mucous membranes or the broken skin of a patient and (2) all health workers with open sores or dermatitis should avoid direct contact with patients or equipment until the condition heals (547).

HIV can be spread by contaminated needles and medical and surgical equipment. Contrary to previous assumptions that the virus is extremely fragile, recent research shows that on a dry surface at room temperature the virus can remain active and capable of causing infection for up to 7 days and, in water, for up to 15 days (55, 457). All health workers should know that simply rinsing needles or other equipment with water and air-drying does not destroy the virus (547). Fortunately, most standard disinfectants and sterilization techniques kill HIV in less than 10 minutes even in concentrations lower than normally used (360, 457, 514). A solution of one part of sodium hypochlorite (household bleach) in 10 parts of water is effective (547). So is alcohol. Of course, contaminated objects would have to come in contact with mucosa or the bloodstream to transmit the virus (see p. L-202). If a patient is inadvertently exposed, through contact with either an infected person or a contaminated object, he or she should be told and offered blood tests, if available, to see if infection has occurred. The option of blood testing should also be offered to health workers who may have been exposed.

Transmission of HIV by unsterilized needles or other instruments is a great concern to developing countries. Often health care workers either do not have the time, equipment, or extra supplies to sterilize needles and syringes properly between uses, or they have not learned

"The more [HIV] infection is disseminated throughout the population before effective control measures begin, the harder it will be to bring it under control."

US Public Health Service Plan for the Prevention and Control of AIDS (570)

how. To clean needles, syringes, and other instruments properly, they must be sterilized by:

- pressurized steam (in an autoclave or pressure cooker) at 121°C (250°F) for at least 20 minutes, or, if that is not possible,
- boiling water for 20 minutes (416, 609, 612).

This procedure destroys HIV and other viruses such as hepatitis B virus. All health care workers who give injections must learn and follow these techniques.

In general, hospitalized patients with AIDS do not have to be in isolation or on special wards. To minimize the risk of contagion, some researchers recommend single rooms for AIDS patients who are incontinent, psychotic, or who have communicable diseases such as tuberculosis or salmonella. Patients whose immune systems are suppressed by drugs or by diseases such as malaria, and so particularly at risk of contracting opportunistic infections, should not be close to people infected with HIV-related diseases (202, 273, 473). Bedclothes from patients infected with HIV should be changed regularly and laundered in water heated to at least 70°C (160°F) (547). Tubs and toilets should be frequently disinfected (622).

Keeping Blood Supplies Free of HIV

WHO recommends that hospitals and blood collection centers:

- Educate potential donors about AIDS and encourage those at risk of HIV infection not to donate.
- Screen all donated blood for HIV antibodies and discard any seropositive blood.
- Inactivate HIV in concentrated blood products by heat treatment or other methods (619).

The US, Canada, and 16 European countries have adopted all of these recommendations, and five other European countries are considering them (552). Routine screening of donated blood is also underway in Japan and Zimbabwe (525, 599). Most developed countries recommend that donors whose blood tests positive on two or more different tests be notified and counseled (600).

Screening blood is the most effective way to keep contaminated blood out of the blood supply. The least expensive and most widely used test can detect at least 99 percent of all blood with HIV antibodies (see box, p. L-204). A very small proportion of contaminated blood samples may escape detection, however, either because the test fails or because the donors were in the 2-week to 2-month period between exposure to the virus and development of antibodies (451).

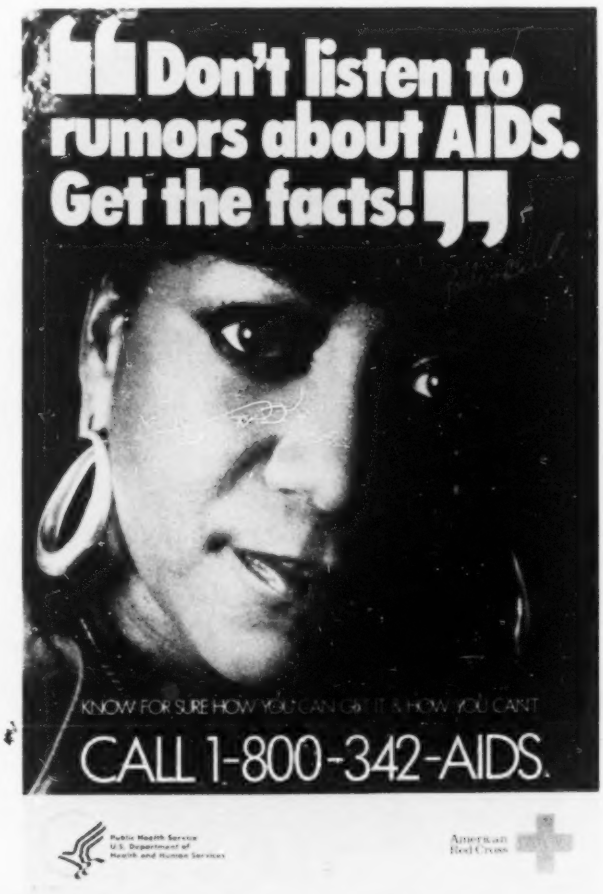
Mass screening is very costly, and many countries may not be able to afford it. In the US, the cost of screening blood is estimated at $80-$100 million dollars per year, or about $6-$8 per unit of blood. This sum includes the cost of the laboratory tests, replacing discarded blood, and counseling antibody-positive donors (488). An additional protection for the blood supply is to set up blood testing facilities separate from blood donation centers. Thus persons who suspect that they are infected will not have to donate blood to find out their status (604).

Because of the expense of screening, developing countries need to draw up very specific guidelines to try to identify high-risk groups or persons who should not donate blood. Where risk groups are not easily defined, this may be difficult. For example, in Zaire researchers could not identify any criteria to screen out possibly infected donors that would not have ruled out the majority of all donors (340).

Whether or not possibly infected donors can be identified, physicians should give transfusions only when absolutely necessary (563, 622). WHO is planning to support research on what proportion of transfusions are necessary. Educating health care professionals about limiting transfusions may be the most feasible way to protect the blood supply in some of the areas where blood testing is not available (340). Where possible, individuals planning to have surgery may want to give blood that can be returned to them if needed. In the US, this practice is recommended by the Public Health Service (647).

Disease Surveillance

Limiting the spread of HIV requires thorough and constant surveillance—reporting and record-keeping on disease


"Don't listen to rumors about AIDS. Get the facts!"
KNOW FOR SURE HOW YOU CAN GET IT & HOW YOU CAN'T
CALL 1-800-342-AIDS.
Public Health Service U.S. Department of Health and Human Services
American Red Cross

Patti La Belle, a singer popular with young people, encourages calls to an AIDS information hotline in the US. Popular entertainers can be trusted sources of information for their fans.

International Effort to Stop AIDS Is Under Way

In May 1986 the World Health Assembly authorized a global strategy to control AIDS (611). This action, by representatives of the world's governments, formally recognized that AIDS is a problem facing all nations, whether they have many AIDS cases, few, or none yet reported.

The World Health Organization (WHO), which has been involved in the effort to control AIDS since 1983, is now organizing a twofold program, involving headquarters and regional office activities and assistance to set up national AIDS efforts (615, 620).

To guide national programs, WHO has outlined recommended steps, starting with "the explicit willingness at the national level to confront the complex problems" of AIDS and HIV (611). The plan calls for setting up a National AIDS Committee, usually under the Ministry of Health, with representatives from health, social services, education, and other sectors. An initial four to eight week epidemiological and resource assessment should follow, leading to development of an ongoing surveillance system and, if needed and feasible, laboratory facilities. The program also should help the health care system recognize and manage HIV-related disease. The principal goal of any national program should be to prevent further spread of HIV infection. Thus, once the program is established, the focus of activity would shift to expanded public education programs and control of specific problems such as blood transfusions, injections, and perinatal transmission (611).

Most recently, in June 1986, WHO convened a 3-day meeting of 22 experts in social marketing, communication, health education, social sciences, and epidemiology to develop recommendations for WHO's educational approach to the AIDS problem. The group urged WHO to develop standardized technical concepts and messages on AIDS for use in a variety of media formats and to promote and coordinate research into the behavioral, social, and communications variables associated with AIDS prevention and control. Recommendations for the development of country programs included establishing an Action Group within each National AIDS Committee to promote and coordinate the research and development necessary to conduct initial AIDS information campaigns and to plan a long-term communication strategy. The meeting outlined standard social marketing/health communication procedures for countries to follow in developing these educational activities (384).

US Support

The United States Agency for International Development (US AID) is providing much of the initial funding for the WHO effort. In June 1986 US AID committed $1 million to help WHO headquarters establish the multidonor assistance package approved by the World Health Assembly. US AID also committed another $1 million to the WHO Regional Office in Brazzaville, Congo. These funds will support WHO surveillance and education activities in four to six African countries with assistance from US CDC (536). WHO itself has allocated about $1.15 million from its regular budget for AIDS control efforts in 1986-87 (611).

WHO publications on AIDS and information about the Control Program on AIDS can be obtained from:

Control Program on AIDS
Division of Communicable Diseases
World Health Organization
1211 Geneva 27
Switzerland

cases for scientific purposes. Disease surveillance programs are important:

1. To find out how prevalent infection is and who is at greatest risk.
2. To learn exactly how HIV is transmitted and how to prevent it.
3. To plan for the care of people with AIDS.
4. To plan for and evaluate the impact of prevention programs.
5. To keep the public aware of the dangers of AIDS.
6. To help generate government support for needed services and research.

Avoiding the collection of information on AIDS or deliberately concealing it will not reduce the spread of infection or the severity of disease. On the contrary, efforts to curb it and to find a cure will be handicapped.

Formal national surveillance began in the US and Europe in 1982. WHO is coordinating the worldwide surveillance effort. To date, 93 countries are reporting (422). In December 1985 WHO and US CDC adopted a provisional clinical case definition of AIDS, based on recommendations of the Workshop on AIDS in Central Africa (605, 622). While this definition may help where laboratory and diagnostic facilities are not available, it must be evaluated in each region because the manifestations of HIV infection may vary.

Costs

The health costs of AIDS and other HIV-related illness are high. In the US, costs for in-hospital medical care per AIDS patient are estimated to range from about $34,000 to $147,000 per year depending on the length of hospital stay and the availability of outpatient services (234, 492). These figures represent only part of the medical costs, however. They do not include the cost of drugs, laboratory tests, or outpatient care.

Governments will be under great pressure to spend more as the epidemic spreads. In the US, in 1985 federal agencies spent $97 million on biomedical research and blood tests, $11 million on education, and $50 million on medical care; in 1986, $234 million for education and research and an estimated $100 million on medical care (143, 382). Total health care costs are much higher, however, because most medical costs in the US are paid by individuals or covered by insurance or local governments. The US Public Health Service estimates that in the US in 1991 there will be 234,000 AIDS cases, and treatment costs will total $800 to $1,600 million (568).

In developing countries reports from a few countries show that AIDS and other HIV-related illness are taking up increasing amounts of scarce health resources. In Mulago

Hospital in Kampala, Uganda, in 1986 one of every 10 new patients in the internal medicine wards had symptoms of AIDS. AIDS is the leading cause of death in these wards (232).

OTHER POTENTIAL PUBLIC HEALTH MEASURES

What else can be done to stop AIDS besides education? Other suggestions fall into two categories: (1) measures to identify infected persons and (2) measures to prevent infected persons from infecting others. Many of these proposals are controversial because they put individual rights and liberties into conflict with efforts to protect public health, but probably the first questions to be addressed concerning any proposed course of action are:

1. Would the measure limit the spread of disease?
2. Would the measure be financially and administratively feasible?

Measures to Identify Infected Persons

Various types of screening have been proposed:

- voluntary screening of high-risk groups,
- mandatory screening of high-risk groups, and
- mandatory screening of low-risk groups or the general population.

There is little disagreement that, where services are available, individuals who want to know their antibody status should be able to obtain confidential testing and counseling. In the US, in fact, 874 sites have been set up for voluntary testing separate from sites for blood donation. Between April 1985 and April 1986 these sites tested about 79,000 people (543).

Proposals to encourage or require screening have been controversial, however. One proponent, US CDC, encourages people in high-risk groups to be tested because it gives them "the opportunity to know their status so they can take appropriate steps to prevent further transmission of the virus" (538). Opponents of screening argue that: (1) It is not clear that learning one's antibody status will encourage safer behavior. (2) Knowing one's antibody status makes no difference to how people should behave. To protect themselves and others, they should use condoms and not share needles. (3) Confidentiality is hard to maintain, and thus discrimination in employment, housing, and insurance may result. (4) Since no cure is available, positive test results would only produce anxiety (35, 94, 97, 126, 226, 361, 386, 387, 423, 578). Some of these arguments have been directed at all screening; some, specifically at screening low-risk groups. Given these arguments, opponents of screening contend that resources would be better spent on education and research.

Research on people's responses to antibody test results is just beginning. A Johns Hopkins University study found that homosexual men who learned their antibody status did not reduce their number of sexual partners more than those who did not learn their status. Both groups in the study had decreased their numbers of partners substantially before either found out their antibody status (187). In contrast, two smaller studies found that, among intravenous drug users receiving information and counseling, those who learned that they were infected reduced the use of drugs and sharing of needles somewhat more than those whose antibody tests were negative (106, 133). Of course, education and counseling must accompany any screening so that those tested can learn how to prevent transmission of the virus.

There has been little government-mandated screening of high-risk groups. The only reported example is the state of Nevada—the only US state where prostitution is legal. Nevada requires monthly antibody tests of all prostitutes in legal brothels, and those testing positive are fired (23).

Other than screening blood donors, the only government-mandated screening of a low-risk group is the US Department of Defense program to test all military recruit-applicants and active-duty personnel. All recruit-applicants have been screened since fall 1985. Applicants testing positive twice on a series of two ELISAs and a Western blot test (six separate tests) are excluded from service. Screening of active-duty personnel began on a small scale in January 1986. Large-scale testing began in July 1986. Active-duty personnel testing positive are limited to US assignments. They are medically discharged if they develop symptoms severe enough to prevent them from working. The military argues that screening (1) excludes recruit-applicants who might not remain fit for military service, (2) protects infected individuals from routinely given live-virus vaccines, which, some think, might activate HIV or might lead to the disease that the vaccine is intended to prevent (see p. L-214), and (3) assures that all military personnel would be able to donate blood safely in battlefield emergencies. All persons testing positive receive appropriate counseling.

Sources of Information on AIDS

Both the US National Library of Medicine (US NLM) and the US Centers for Disease Control (US CDC) publish materials to help health professionals and others keep abreast of the rapidly growing body of research on AIDS and HIV infection. These materials are available without charge. US NLM has published 10 bibliographies on AIDS since 1983. These bibliographies include references to articles on all aspects of AIDS published since 1980 in some 3,300 major biomedical publications. The most recent bibliography, covering April-June 1986, includes over 500 items. Literature searches on AIDS and on approximately 30 other topics each year may be ordered by sending a self-addressed, gummed mailing label to:

Literature Search Program
Reference Section
National Library of Medicine
8600 Rockville Pike
Bethesda, Maryland 20894, USA

US CDC material on AIDS includes: (1) for the general public, fact sheets and brochures and (2) for health professionals, US CDC recommendations and guidelines concerning AIDS and a periodically updated compilation of all reports on AIDS from *Morbidity and Mortality Weekly Report*. Requests should be sent to:

CDC Public Inquiries Office
1600 Clifton Road, N.E./Building 1, Room B63
Atlanta, Georgia 30333, USA

In addition, active duty personnel found antibody positive are clinically evaluated at least once a year (584).

Screening has been suggested for people in certain settings—food handlers, farm workers, blood bank personnel, teachers, and students—on the mistaken belief that these people might transmit the disease at work or school (9, 15, 517). There is no evidence that HIV has been transmitted in these settings.

One argument against trying to screen large, low-risk populations is the enormous cost. At $1 to $3 (US) for the ELISA and $90 for a confirmatory Western blot test, mass screening would be beyond the means of most countries. The health department of the US state of New Jersey recommended against mandatory screening of all students after estimating that testing the state's 2.2 million students would cost $25 million (524)—that is, an average of about $11 apiece. US military testing cost $3-$4 million for the first 750,000 people tested (140). Furthermore, to be effective, mass screening would have to be repeated frequently, which would multiply the cost.

In the US, as the public has become more aware that HIV can be transmitted among heterosexuals and from mother to fetus, interest in premarital screening has increased (335). Many US states and many other countries, before granting a marriage license, require a blood test to detect syphilis infection. State legislators in some US states have recently proposed requiring premarital HIV antibody tests (26). The American Medical Association decided against recommending such mandatory testing on the grounds that it would do little to prevent the spread of disease and would only arouse public fears (7).

Contact tracing—identifying contacts of infected persons and referring them for medical examination—has been an essential strategy to control sexually transmitted diseases (80, 109). This strategy has serious limitations where HIV is concerned. The period between infection and detection of infection, whether through testing or diagnosis of symptoms, may be so long that an infected person may already have infected many others—and each of them, many others in turn (130). Moreover, given the stigma attached to infection, many persons may refuse to reveal the names of their contacts (35, 80, 412). Finally, tracing any disease is more difficult now than in the past because people are more mobile (48).

Proposed Measures to Prevent Spread of Infection

Several other public health measures have been suggested, such as:

- isolating infected persons,
- restricting their travel and immigration, and
- providing sterile needles to intravenous drug users.

In spite of abundant evidence that HIV is not spread through everyday contact (see p. L-205), increasing public fear of AIDS has led to suggestions of isolating at least some persons with AIDS. For example, schools in several US states have attempted to keep children with AIDS from attending classes (4, 10). For the most part, courts have agreed with public health officials that children with AIDS or HIV infection generally are not a health threat to others (95, 236). The US CDC considers school attendance safe except if a child with AIDS lacks control of bodily secretions, has open lesions, or behaves in a way that might infect others, such as biting (541). Even in such instances most experts consider transmission unlikely (10, 27, 533).

Quarantine laws in many countries authorize public health officials to isolate people with infectious diseases forcibly if they pose a serious threat to the health of others (62, 88). To date such powers have been used very rarely with AIDS cases (11, 16). Long-term, even indefinite quarantine has been proposed in the US press and in US state legislatures for persons with AIDS and even for infected but asymptomatic persons. Experts are agreed, however, that quarantine of persons with AIDS would not stop the spread of HIV, since transmission can occur in the often lengthy period before a person develops symptoms. Quarantine of all infected persons would not be feasible even if it were effective (88, 402). It would require universal screening and indefinite quarantine (236, 313, 387), and in some places it would involve overwhelming numbers of people. Worst of all, the threat of quarantine would certainly lead many people to avoid diagnosis and care. It could even discourage taking precautions against spreading the disease.

Some countries have asked WHO whether a certificate stating that a person is not infected with HIV should be required for international travel. At a December 1985 meeting the directors of the WHO Collaborating Centers on AIDS decided that testing and certification of international travelers is not warranted (613). One country, Saudi Arabia, currently requires a medical report certifying that a visitor is free of HIV infection (3).

Some public health experts have argued that making it easier for intravenous drug users to obtain sterile needles would reduce the spread of HIV (25, 85, 145). They point out that in Canada, where needles are sold without prescription, cases of AIDS related to intravenous drug use are rare (145). Opponents of providing sterile needles argue that doing so would encourage drug abuse and that there is no evidence that intravenous drug users would use sterile needles if they were available (70). There is recent evidence, however, that intravenous drug users in New York are more aware of AIDS, are reducing needle-sharing, and are increasingly trying to obtain sterile needles (146). One suggested strategy is to distribute sterile syringes and needles through government-run facilities, while at the same time expanding information and drug treatment programs to help addicts overcome their addiction (21, 355). In Amsterdam in 1984 the Municipal Health Service started a needle exchange program to provide free sterile needles and syringes to intravenous drug users when they return used ones. In 1985, when about 100,000 syringes and needles were provided, the number of intravenous drug users did not increase, and the number of users desiring entry into treatment programs increased. The Health Service also provides free condoms to prostitutes who use intravenous drugs (92).

In short, despite the strong motivation to check the spread of AIDS, very few of the screening or restrictive measures suggested to date would work on a large scale. Thus currently the bulk of the effort to slow the spread of the AIDS virus must be educational programs. These programs must emphasize to those at risk and those already infected how important it is to reduce the number of sexual partners and to adopt safe sexual practices—above all, always to use condoms.

Table 1. Prevalence of Serum Antibodies Against Human Immunodeficiency Virus, as Measured by at Least Two Different Screening Tests in Selected Populations, Selected Studies, 1984–1986

Place, Date (Ref. No.)	Population	Tests	Date of Sample	% with HIV Antibodies
AFRICA				
Cameroon 1986 (157)	1,273 persons sampled in household survey	ELISA, WB and/or RIPA	1985	1
	616 hospital outpatients, internal medicine department			0.3
	162 clients of MCH[1] clinics in Yaoundé & Garoua			0
	314 female prostitutes in Meiganga			3
	195 hospital inpatients in Yaoundé & Douala			1
Central African Republic 1986 (380)	1,263 persons from randomly selected households in Bangui	ELISA & WB	[1985]	4
Central African Republic 1986 (204)	327 persons age 15–34, randomly selected from urban population	ELISA & WB	1985	2
	930 persons age 15–34, randomly selected from urban population		1986	4
	55 "hospitality girls" (low SES)	ELISA, WB & IFA	1985	16
	179 "hospitality girls" (middle SES)		1985	12
Congo 1986 (380)	360 persons from randomly selected households in Pointe Noire	ELISA & WB	[1985]	0
	368 persons from randomly selected households in Brazzaville			5
Equatorial Guinea 1986 (380)	333 persons from randomly selected urban & rural households	ELISA & WB	[1985]	0.3
Gabon (rural & semi rural areas, Haut Ogoue Province) 1986 (147)	768 pregnant women & new mothers	ELISA, WB, & RIA	1985–86	0.3
	315 children			0.3
	337 adolescents & adults			1.5
Kenya (Nairobi) 1986 (302)	64 prostitutes (low SES), mean age 29	ELISA (2) & WB	1985	66
	26 prostitutes (higher SES), mean age 24			31
	40 men at STD clinic, mean age 29			8
	42 healthy medical personnel, mean age 26, 24 men, 18 women			2
Kenya (Nairobi) 1986 (435)	58 female prostitutes[a]	ELISA, WB & IFA	1981	4
	58 female prostitutes		1982	6
	39 female prostitutes		1983	14
	76 female prostitutes		1984	59
	215 female prostitutes		1985	59
	118 men with genital ulcers enrolled in chancroid treatment studies	ELISA, WB & IFA	1980	0
	70		1981	3
	28		1982	6
	93		1983	14
	107		1985	18
	111 pregnant women	ELISA, WB & IFA	1981	0
	735 pregnant women		1985	2
Kenya (Nairobi) 1986 (510)	535 female prostitutes (low SES), mean age 29	ELISA, WB & IFA	1985	67
Malawi (Blantyre) 1986 (440)	200 consecutive women attending prenatal clinic	ELISA & WB	1986	2
Mauritius (Port Louis) 1986 (440)	100 women attending prenatal clinic	ELISA & WB	1986	0
Nigeria (Ibadan) 1986 (440)	200 consecutive women attending prenatal clinic	ELISA & WB	1986	0
Rwanda (Butare) 1986 (440)	495 children, age 8–19 months, attending outpatient MCH clinic	ELISA & WB	1986	0.6
Southern Africa 1985 (504)	150 white South African medical workers	ELISA (2) & IFA	[1985]	0
	1,740 black blood donors in Johannesburg area, South Africa			0.3
	35 unspecified samples from Botswana			3
	22 unspecified samples from Swaziland			0
	164 unspecified samples from Lesotho			0
	240 unspecified samples from Transkei, South Africa			2
	500 samples mainly from black Zimbabwian prisoners			1
	87 unspecified samples from Malawi			24
Tanzania (rural Kagera) 1986 (186)	21 patients with AIDS: 9 men, mean age 32; 12 women, mean age 26	ELISA & WB	1985	100
	34 age- and sex-matched controls			32
	78 barmaids			31[b]
Uganda 1985 (60)	13 men with endemic KS, mean age 46	RIPA & IFA	1984	8
	4 patients with atypical KS, mean age 31; 3 men, 1 woman			100
	51 patients with various disorders and healthy students and doctors, mean age 27			20
Uganda 1986 (330)	370 blood donors from Mulago & Mysambia Hospitals, Kampala	ELISA & WB	1986	11
	1,011 women, age 16–25, attending prenatal clinics, Kampala		1986	14
	100 persons randomly selected from admissions to medical ward of Mulago Hospital		1985	27
	100 persons attending outpatient clinic, Kitovu Hospital, Masaka		1986	30
Zaire (Kinshasa) 1986 (345)	2,384 staff of Mama Yemo Hospital, mean age 37, 61% men	ELISA (2) & WB	1984	6
Zaire (Kinshasa) 1986 (342)	368 children admitted to Mama Yemo Hospital for various conditions except measles, ages 2–14, mean age 6, 53% males	ELISA (2) & WB	1984–85	11
	92 healthy siblings, mean age 7, 53% males			1
Zaire (Kinshasa) 1986 (142)	258 mothers of hospitalized children age 1–24 months in Mama Yemo Hospital	ELISA & WB	1985	8
	150 hospitalized children age 9–24 months of these mothers , Mama Yemo Hospital			15
	191 mothers of children attending well-baby clinics, Mama Yemo Hospital			8
	56 children, age 9–24 months, of these mothers, Mama Yemo Hospital			4
Zaire (Kinshasa) 1986 (347)	376 female prostitutes	ELISA & WB	1985	27

Table 1 continued

Place, Date (Ref. No.)	Population	Tests	Date of Sample	% with HIV Antibodies
Zaire (Kinshasa) 1986 (148)	805 mothers at well-baby clinics[c]	ELISA, IFA & RIPA	1970	0.3
	498 mothers at well-baby clinics[c]		1980	3
	529 mothers	ELISA & IFA	1986	6
Zaire (Kinshasa) 1986 (341)	159 inpatients in tuberculosis sanitorium with confirmed pulmonary tuberculosis, median age 29, 60% men	ELISA (2) & WB	1985	27[d]
Zambia (Lusaka) 1986 (245, 453)	272 women delivering at University Hospital	ELISA & WB	1985	8
	125 healthy persons			17
	200 clients of STD clinic, 70% men			30
	200 clients of STD clinic in a northern province, 50% men			40
ASIA				
Hong Kong 1986 (111)	7,605 healthy persons, blood & sperm donors, hospital inpatients, hemophiliacs, hospital workers[e]	ELISA & IFA	1985	0.1
India (Madras) 1986 (271)	102 female prostitutes, ages 20–30	ELISA & WB	[1986]	6
Japan 1986 (614)	24,000 + healthy blood donors	ELISA & IFA	[1985–86]	0
Thailand 1986 (618)	101 male prostitutes	ELISA & WB	1985	1
	399 persons: 100 female prostitutes, 100 heterosexual men with STDs, 158 thalassemia patients, 35 hemophiliacs			0
LATIN AMERICA				
French Guiana 1984 (201)	211 Haitian immigrants of all ages, 50% males	ELISA & WB	1983	3
Haiti 1986 (229)	533 mothers of infants age 5–14 months receiving vaccinations[c]	ELISA & WB	1982	6
	533 infants of these mothers[c]			0.8
Peru (Lima) 1986 (462)	98 men in homosexuals' bars, mean age 29	ELISA & WB	1985	11
DEVELOPED COUNTRIES				
Austria 1985 (196)	34 imprisoned drug users, age 20–34, 85% heterosexual men, 15% women	ELISA & WB	[1985]	44
Greece 1985 (418)	200 registered female prostitutes	ELISA & WB	[1985]	6
	10,000 blood donors			0
Italy 1985 (176)	183 IV drug users	ELISA & IFA	1979–81	2
	265 IV drug users		1982–83	29
	271 IV drug users		1984–85	35
Spain 1985 (601)	42,523 blood donors (locations NA)	ELISA & IFA	1985	0.06
	14,522 blood donors in Madrid			0.09
	538 IV drug users			64
	226 homosexual & bisexual men			13
	297 hemophiliacs			68
	5 children of seropositive women			60
Switzerland (Zurich) 1985 (491)	103 IV drug users	ELISA & RIA (2 types)	[1984]	36
	40 healthy homosexual men			10
Switzerland (Bern) 1985 (393)	93 IV drug users	RIA & ELISA or IFA	1979–81	0
	128 IV drug users		1982–83	16
	75 IV drug users		1984–85	37
United Kingdom (Edinburgh) 1986 (459)	164 IV drug users, average age 24, 72% men	ELISA & IFA or WB	1986	51
United Kingdom (Glasgow) 1986 (185)	606 IV drug users, mean age 22, 74% men	ELISA & IFA	1985	5
United Kingdom (Britain) 1986 (272)	4,035 healthy homosexuals	RIA (2 types) & IFA	1984–85	21
	1,847 hemophiliacs			31
	239 IV drug users			10
United States 1985 (489)	1,027,786 blood units	ELISA (2) & WB	1985	0.04[f]
United States 1985 (557)	142 male homosexual clients of STD clinic in San Francisco	ELISA & WB	1985	49
United States 1985 (372)	541 health workers with parenteral or mucous membrane exposure to patients with AIDS or other HIV-related illness and not acknowledged members of high-risk groups	ELISA & WB	NA	0.6[g]
United States (New York City) 1986 (521)	378 male homosexuals in prospective hepatitis study	ELISA & WB	1978–79	7
	same study participants		1984	44
United States 1984 (513)	86 IV drug users in New York	ELISA & RIPA	1984	58
	70 healthy US CDC employees			0
United States (Massachusetts) 1984 (293)	50 hemophiliacs, age 1–69	IFA & RIPA	1983–84	46
	29 healthy lab workers			0
United States 1986 (562)	308,076 military recruit-applicants, age >16, 85% men	ELISA & WB	1985–86	0.15
United States 1986 (472)	4,936 homosexual men from 5 cities in the Multicenter AIDS Cohort Study	ELISA & WB	1986	38
West Germany (6 cities) 1985 (486)	6,720 blood donors	ELISA & RIPA	1984	0.2

Note: This table is restricted to studies involving initial tests of blood samples plus confirmatory tests by one or more different test methods. Populations reported generally were selected from presumed high-risk groups or the population at large, as indicated; populations selected because they exhibited symptoms suggesting HIV infection are generally excluded from this table.

Note: Samples dated before 1985 are assumed to involve frozen, stored sera.

NA = not available
ELISA = enzyme-linked immunosorbent assay
HIV = human immunodeficiency virus
IFA = immunofluorescence assay
KS = Kaposi's sarcoma
MCH = maternal and child health
RIA = radioimmunoassay
RIPA = radioimmunoprecipitation assay
SES = socioeconomic status
STD = sexually transmitted disease
US CDC = United States Centers for Disease Control
WB = Western blot assay (immunoblot)

[a] This cohort was of higher SES, with lower average number of sexual partners than other prostitutes.
[b] Only 24 of 29 ELISA-positive samples were tested by Western blot.
[c] Use of frozen stored sera indicated.
[d] Only 43 of 53 ELISA-positive samples were tested by Western blot.
[e] 4 of 5 seropositive subjects are hemophiliacs.
[f] Only 1,455 of 1,723 ELISA-positive samples were tested by Western blot.
[g] Nonoccupational exposure may have caused infection in one of two infected health workers.

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